

EXHIBIT 19

**UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT SEATTLE**

MICROSOFT CORPORATION,

Plaintiff,

V.

MOTOROLA, INC., et al.,

Defendants

CASE NO. C-10-1823JLR

REBUTTAL REPORT OF MICHAEL T. ORCHARD, PH. D.
August 10, 2012

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REBUTTAL EXPERT REPORT OF MICHAEL T. ORCHARD, PH.D.

I. SUMMARY

1. Dr. Drabik identifies seventeen U.S. patents from Motorola Mobility, Inc.’s (“MMI’s”) portfolio that he says are infringed by Microsoft Corporation’s products that comply with the H.264 Standard.

2. Fourteen of the seventeen patents apply only to decoders that process interlaced video. Interlaced video has little value in in general¹ and to Microsoft products in particular.² It is not normally used for computer applications or video games, and is not usually distributed over the Internet, either through ordinary websites or through Internet-based multimedia platforms.³ Microsoft’s Xbox Live service does not distribute interlaced video.⁴

3. While Dr. Drabik cites examples where interlaced video is used, his examples simply underscore how little value interlaced video has for Microsoft products. His first example involves pirated video files that were obtained from television sources and copied to a computer. He obtained one of the pirated video files from an illegal Swedish file sharing website. He obtained the second pirated video file from a French website that appears to have stored the video file for testing purposes. There is little value to Microsoft, obviously, in facilitating the illegal use of stolen video files.⁵

¹ See § III.B, *infra*.

² See §§ V.A(i) (Xbox), V.A.ii (Windows desktop operating systems), V.A.iii (Windows Phone), V.A.iv (Windows Embedded), V.A.v (Silverlight), V.A.vi (Zune), V.A.vii (Skype), V.A.viii (Lync).

³ See § III.B, *infra*.

⁴ See § V.A.i.b, *infra*

⁵ See § III.B, *infra*.

4. For his second example, Dr. Drabik points to two obscure Blu-ray movies titles. However, the vast majority of Blu-ray movies are encoded in progressive form, and thus there is little value associated with the ability to decode interlaced video in Blu-ray movies.⁶ In any event, the whole issue of decoding Blu-ray movies is beside the point because Microsoft's products cannot normally decode Blu-ray content. Xbox game consoles do not have Blu-ray drives.⁷ Windows computers can only decode Blu-ray content if non-Microsoft software is installed.⁸

5. To be sure, interlaced video has historically been used in broadcast television in the United States, although even for television, interlaced video will likely be replaced as well.⁹ In any event, Microsoft products do not normally decode interlaced video television content.¹⁰ Dr. Drabik helps illustrate the point with the example he cites: a service from AT&T called "U-verse" that was once available as an add-on to Xbox. It is true that U-verse made use of interlaced video television content and was usable through Xbox. However, there were alternative methods by which AT&T customers could access the U-verse service, and using Xbox in this way required the installation of special software available from AT&T. AT&T no longer offers the software, and has not done so since May 2012.¹¹

6. MMI's fourteen interlaced video patents are therefore of little value to Microsoft.

⁶ See § III.B, *infra*.

⁷ See § V.B.i.a, *infra*.

⁸ See § V.A.ii.b, *infra*.

⁹ See § III.B, *infra*.

¹⁰ See §§ V.A(i) (Xbox), V.A.ii (Windows desktop operating systems), V.A.iii (Windows Phone), V.A.iv (Windows Embedded), V.A.v (Silverlight), V.A.vi (Zune), V.A.vii (Skype), V.A.viii (Lync).

¹¹ See § V.A.i.e, *infra*.

7. Even for television broadcasters and other users of interlaced video, the fourteen MMI patents would have been of little value if one considers their value as of the time that the H.264 Standard was developed. At that time, each MMI patent could easily have been written out of the H.264 Standard because suitable alternative technologies were available elsewhere. Eight of the patents relate to a feature called “MBAFF,” but a prior art version of MBAFF could have been used in the H.264 Standard instead, with minimal performance difference.¹² Two other MMI patents relate to “alternate scan paths,” but other alternative scan paths existed with virtually no performance difference from the one in H.264.¹³ Three MMI patents relate to a feature called “PICAFF” in combination with various other features, but PICAFF and these various other features were already in the prior art and could have been employed in the H.264 Standard in their prior art form without implicating any MMI patented technology. Beyond that, several alternatives to PICAFF were known and could also have been used.¹⁴ Finally, one MMI patent describes using three specific neighboring motion vectors to predict a current motion vector. But the H.264 Standard did not need to employ this technology: there were many possible alternatives, including the use of a different number of neighboring motion vectors or the use of neighbors that differed from the specific ones claimed by MMI.¹⁵

8. As indicated above, three of the seventeen MMI patents do not involve interlaced video content: U.S. Patent 5,235,419 (the “ ‘419 patent”), U.S. Patent 5,376, 968 (the “ ‘968 patent”), and U.S. Patent 6,836,514 (the “ ‘514 patent”). The ‘419 and ‘968 patents include

¹² See § IV.A.iii.c, *infra*.

¹³ See § IV.A.iii.e, *infra*.

¹⁴ See § IV.A.iii.d, *infra*.

¹⁵ See § IV.A.iii.f, *infra*.

claims covering decoders, but the “means plus function” nature of all these claims limit their scope in the United States to hardware decoders. No Microsoft products infringe these patents because the pertinent Microsoft decoders are all implemented using software, not hardware.¹⁶ There are German counterpart patents that are infringed (according to a finding of a German court), but the German courts did not consider invalidity.¹⁷ These patents are plainly invalid¹⁸ and thus of little value.

9. Even apart from these facts, the ‘419 and ‘968 patents have relatively little value because they relate to the use of multiple block sizes and multiple compression modes. At the time the H.264 Standard was adopted, prior art approaches for these techniques existed that did not involve Motorola patented technology. They could have been written into the standard instead.¹⁹

10. The last MMI patent that Dr. Drabik discusses, the ‘514 patent, was not listed by MMI in its interrogatory answer listing its H.264 Standard essential patents. I understand from counsel that there is a legal question as to whether any evidence concerning this patent can properly be considered at trial. However, if the Court does consider evidence concerning this patent, it is my view that Microsoft’s H.264 Standard-compliant products do not infringe this patent. While Dr. Drabik claims that this the ‘514 patent is an H.264 Standard essential patent, I do not agree that he has demonstrated this. Dr. Drabik cites entire Annexes of the H.264 Standard without specifying which parts of those Annexes match the claim elements. And the

¹⁶ See § IV.A.iii.a(v), *infra* (‘419 patent); § IV.A.iii.b(iii), *infra* (‘968 patent).

¹⁷ See § IV.B.ii, *infra*.

¹⁸ See § IV.A.iii.a(iv), *infra* (‘419 patent); § IV.A.iii.b(i), *infra* (‘968 patent).

¹⁹ See § IV.A.iii.a(i) and (iv), *infra* (‘419 patent); § IV.A.iii.b(i) and (ii), *infra* (‘968 patent).

cited Annexes do not include functionality claimed by the '514 patent. This may possibly be why MMI omitted the '514 patent from its interrogatory answer that identified its H.264 Standard essential patents. In any event, the Annexes Dr. Drabik cites are not mandatory parts of H.264 and Dr. Drabik has not explained why he believes they would be employed in Microsoft's products.²⁰

11. I therefore conclude that, from a technical standpoint, the MMI patents discussed by Dr. Drabik have little, if any, value to Microsoft.

12. Apart from his erroneous assessment of the value of the MMI patents, there is an overriding technical flaw in Dr. Drabik's opening report: he repeatedly overstates Microsoft's reliance on its H.264 decoders. Microsoft's products have many uses, and H.264 video coding is but a tiny part of their many functionalities. For example, the Windows operating systems provide the underlying software for personal computers, laptops, and smartphones.²¹ They facilitate the basic operation of the computer, including managing software applications, mediating between hardware (such as keyboard and mouse, computer processors, or Internet interfaces) and software that relies on that hardware, and policing the security and stability of the computer system.²² Windows operating systems provide numerous user-facing features as well, including accessory applications such as control panels and basic word processors, to name just a few.²³ While the Windows software is capable of decoding H.264 content, applications running on a Windows computer normally rely on third-party hardware to provide H.264 video

²⁰ See IV.A.iii.g, *infra*.

²¹ See § V.A.ii.d, *infra*.

²² *Id.*

²³ *Id.*

decoding.²⁴ The H.264 decoder software in Windows is only used where no such third-party hardware is available.²⁵ Even among software decoders, some applications like Flash contain their own software decoder rather than the one provided in Windows.²⁶ Accordingly, if one ranked the different functionalities of Windows in terms of value, H.264 video coding would not rank particularly high.

13. Windows Phone 7 provides no software H.264 decoder at all, leaving the decoding to third party hardware.²⁷

14. For Microsoft's Xbox game console, the video game functions do not even use H.264.²⁸ While decoding H.264 video files is one video application of an Xbox, the Xbox product also has the ability to decode other video codecs, including MPEG-4 part 2 and WMV.²⁹ Again, if one ranked the functionalities of an Xbox console, H.264 video coding would not rank particularly high.

II. PRELIMINARY STATEMENT REGARDING PATENTS AT ISSUE

15. Based on MMI's discovery responses and the mode of analysis adopted by Dr. Drabik, the technological contribution and importance of MMI's entire essential, worldwide patent portfolio can be assessed by analyzing the following seventeen MMI patents:

²⁴ See § V.A.ii.a, *infra*.

²⁵ *Id.*

²⁶ *Id.*

²⁷ See § V.A.iii, *infra*.

²⁸ See § V.A.i.a, *infra*.

²⁹ See § V.A.i.b, *infra*.

Eifrig “neighboring motion vector” family: 6,005,980

Wang “alternate scan” family: 7,162,094; 6,987,888

Wang “MBAFF” family: 6980596; 7310374; 7310375; 7310376; 7310377; 7421025; 7477690; 7817718

Wang “PICAFF” family: 7769087; 7660353; 7,839,931

Krause “adaptive block size” family: 5235419

Wu “adaptive block size” family: 5376968

Gandhi “error resilience” patent: 6836514

16. In this report, I will refer to these patents as “the seventeen MMI patents at issue.” I explain why I focus my rebuttal on these patents in the subsections below.³⁰

A. Patent families

17. To understand the MMI patents that MMI contends are essential to H.264, I reviewed three documents: 1) MMI’s October 29, 2010 H.264 offer letter (Ex. D to my opening report); 2) MMI’s response to Interrogatory No. 17 (Ex. E to my opening report); and 3) Dr. Drabik’s opening expert report. MMI’s October 29 offer letter identified eight patent families. MMI’s Interrogatory response identified six patent families, leaving out the family related to U.S. Patent No. 6,807,317 to Matthew (“deblocking”) and the family related to U.S. Patent No.

³⁰ Dr. Drabik also considers one application. (Application No. 12/907,656.) An application is not a granted patent and so I do not include it in this number. In any event, I will explain in this report that the application Dr. Drabik identifies covers the same technology as another Motorola granted patent and therefore does not add any technical value to Motorola’s portfolio, even if granted.

6,836,514 to Gandhi (“error resilience”). I understand this to mean that MMI no longer claims that these two patent families are essential to H.264.

18. Dr. Drabik’s report analyzed the six patent families identified in MMI’s Interrogatory response. In addition, Dr. Drabik included comments about the deblocking family, but never contended that this patent is essential to H.264 and added a footnote stating that “During reexamination [of this patent], claims directed to subject matter essential to the H.264 Standard were canceled.” (Drabik Opening Report at ¶ 266.) Moreover, Dr. Drabik did not opine that Microsoft infringes MMI’s deblocking patents. I agree that this patent is not essential to H.264. This confirms that MMI’s deblocking patents are not essential to H.264.

19. In addition, Dr. Drabik’s report addressed the error resilience family. I disagree that this patent is essential to the H.264 Standard. As I will explain below, Dr. Drabik’s analysis of how this patent relates to H.264 is incomplete. Moreover, the analysis presented is flawed. I am considering that patent, for the purposes of this report, as one of the “MMI patents at issue” but I do not believe it is essential to H.264.

B. Foreign patents

20. MMI’s patent families include foreign patents. In reviewing MMI’s offer letter, Interrogatory response, and Dr. Drabik’s expert report, I noted various discrepancies among the specific foreign patents identified in these documents. However, all foreign patents identified in these documents fall within the one of the families discussed above. Moreover, Dr. Drabik operated under the assumption that the U.S. patents are representative of the technology contribution offered by all foreign patents in the patent families. Accordingly, regardless of the specific foreign patents that MMI identifies or the discrepancies that exist among MMI’s documents, my analysis of each patent family will apply to all of MMI’s essential patents on a world-wide basis.

III. THE VALUE OF MMI'S CONTRIBUTIONS TO THE H.264 STANDARD

A. Dr. Drabik incorrectly claims that adaptive frame/field coding is a "basic" feature of H.264 in order to amplify the importance of Motorola's interlaced coding patents

21. Dr. Drabik distinguishes between "basic" and "ancillary" features of H.264 and then identifies adaptive frame/field coding as one of five basic features.

7	52. The basic features of H.264 are adaptive frame/field coding, prediction, transform
8	and quantization, and entropy coding.

22. (Drabik Opening Report at ¶52; *see also* ¶ 48.) Dr. Drabik does not consistently use the term "basic" or define what he means by that term. At times, he uses "basic" to mean a core architectural component of H.264. (*See, e.g.* Drabik Opening Report at ¶ 60.) At other times, he apparently uses "basic" means essential to practicing H.264. (*See, e.g.* Drabik Opening Report at ¶ 48.) In either case, Dr. Drabik is incorrect that adaptive frame/field coding is "basic" to H.264. In my view, and in the view adopted by relevant academic literature, the basic components of H.264 are prediction, transform, quantization, and entropy coding. Dr. Drabik added adaptive frame/field coding to this list in order to inflate the value of MMI's patent portfolio. "Adaptive frame/field coding" and associated interlaced coding tools are used in only specific types of encoding and therefore of less importance than prediction, transform, quantization, and entropy coding.

i. "Adaptive frame/field coding" relates to MMI's interlaced coding patents, which are the vast majority of MMI's patent portfolio

23. Of the seventeen MMI patents at issue, fourteen claim functionality related to interlaced coding. Interlaced coding only occurs when a portion of a video image was encoded in "field mode" rather than "frame mode." Interlaced coding tools are only used in instances

where the encoder selected field mode. For this reason, as a practical matter, interlaced coding tools will only be used if adaptive frame/field coding is used.

24. Specifically, an H.264 encoder will not select field mode for progressive video content. (H.264 Standard at § 0.6.2.) For interlaced video content, the encoder adaptively selects field mode. (*See, e.g.*, Iain E. Richardson, The H.264 Advanced Video Compression Standard, 2nd Edition, at 111, indicating that the two ways of encoding a video sequence are “frame mode only” or “Frame/Field mode”). The adaptive selection occurs in one of two ways. (*Id.*) First, it can select field mode on a picture-by-picture basis. (H.264 Standard at § 0.6.2.) This is called picture-level Adaptive Frame/Field Coding, which I abbreviate as PICAFF and Dr. Drabik abbreviates as PAFF. Second, the encoder can select field mode at a finer level of granularity, splitting a picture up into macroblock pairs and deciding whether each macroblock pair should be encoded in field mode. (H.264 Standard at § 0.6.2; § 6.3; Fig. 6-8.) Dr. Drabik and I refer to this as MBAFF.^{31,32} As mentioned, fourteen of the seventeen MMI patents at issue only apply when field coding is used. That means they will only apply if an H.264 encoder uses

³¹ The term “MBAFF” is somewhat ambiguous because adaptive frame/field coding at the level of single macroblocks was already known in the prior art and labeled as MBAFF. (*See* my opening report at pages 166-177.) H.264 (and Motorola’s patents) apply MBAFF at the level of macroblock pairs. I will attempt to distinguish between the two MBAFF variants in this report.

³² In other litigation and in this case as well, I explained that for these patents, “macroblock” means a rectangular group of pixels. The Court construed “macroblock” to have this meaning. (*See* Case 2:10-cv-01823-JLR, Doc. No. 258.) Under that definition, Motorola’s version of MBAFF and the prior art version of MBAFF apply the same concept and Motorola’s patents are invalid. For the purposes of this report, I distinguish the two versions, but that does not mean I believe the claims in this patent family actually encompass anything different than the prior art version of MBAFF.

adaptive frame/field coding. The table below lists the specific patent numbers that require either adaptive frame/field coding or require field mode processing that can only result from adaptive frame/field coding:

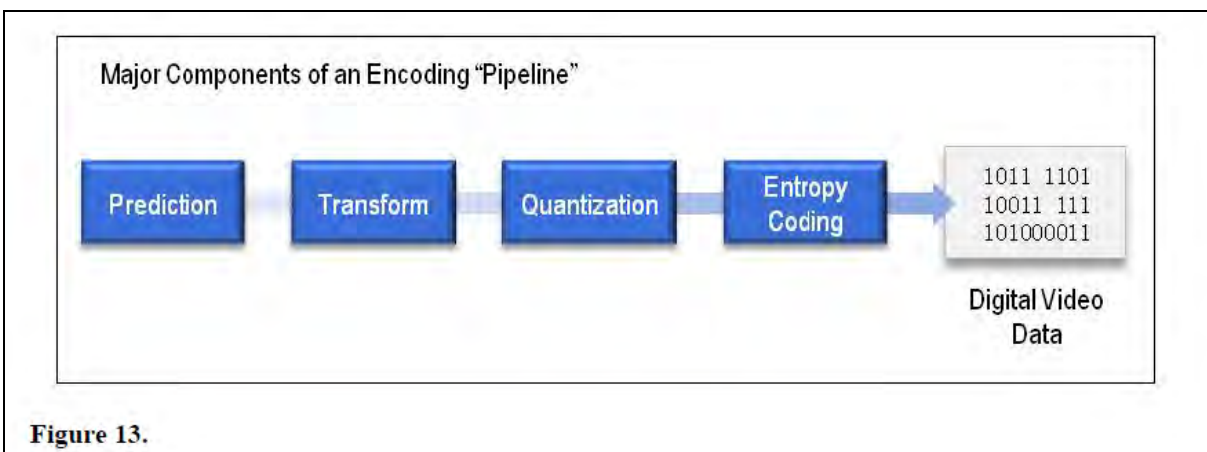
<u><i>MMI US patents analyzed by Dr. Drabik specific to interlaced coding</i></u>	<u><i>MMI US patents that do not require interlaced coding</i></u>
7,162,094	5,235,419 (expired, claims not practiced by Microsoft because claims do not cover software decoders, as I will explain below)
6,987,888	
6,980,596	
7,310,374	5,376,968 (soon to expire, claims not practiced by Microsoft because claims do not cover software decoders, as I will explain below)
7,310,375	
7,310,376	
7,310,377	6,836,514 (not practiced by H.264 devices, as I will explain below)
7,421,025	
7,477,690	
7,817,718	
7,769,087	
7,660,353	
7,839,931	
6,005,980	

25. As can be seen, in order to opine that MMI's patent portfolio has any meaningful value, Dr. Drabik needed to take the position that adaptive frame/field coding is "basic" to H.264. As will explained below, that position has no basis in academic literature and contradicts Dr. Drabik's own prior testimony. It is also inconsistent with how H.264 is used.

ii. If one interprets "basic" as a core architectural component, adaptive frame/field coding is not basic

26. In paragraphs 52 – 60 of his report, Dr. Drabik appears to interpret "basic" to mean a core architectural component. (*See, e.g.* Drabik Opening Report at ¶ 60) (stating that "[t]he operations described above are the core of the H.264 Standard"). In fact, the core

architectural components of H.264 are prediction, transform, quantization, and entropy coding. I explained this in my opening report, exemplified by Figure 13:



27. (See my opening report at page 25.) Another MMI expert, Michael Dansky, identified the exact same components that I did. Mr. Dansky did not include adaptive frame/field coding:

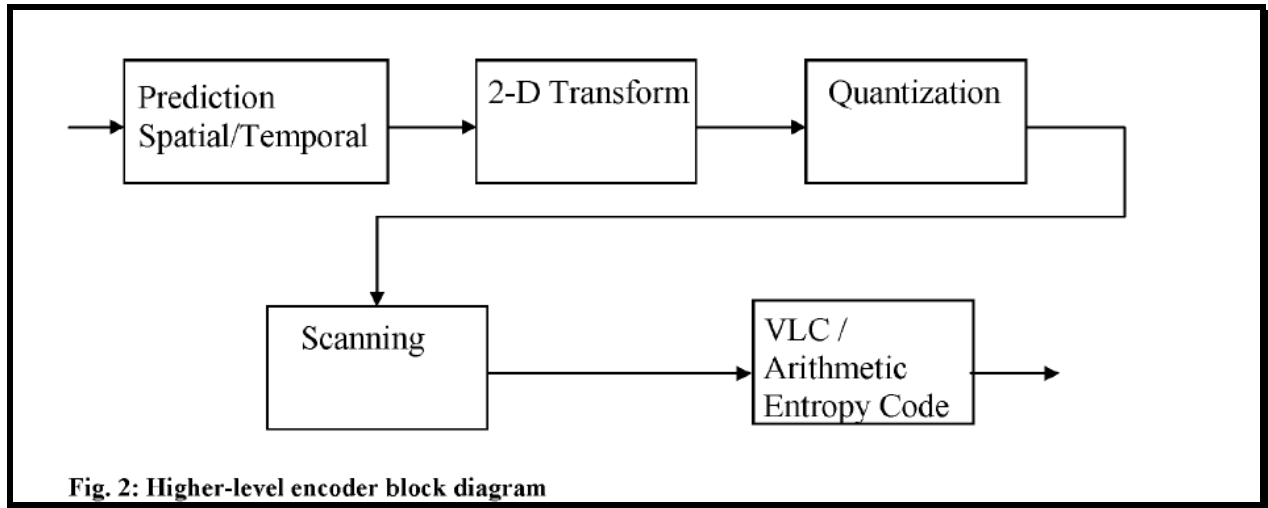
There are multiple steps involved in encoding (or decoding) video. These steps include prediction, transform, quantization, and entropy coding. Prediction eliminates redundancy from

(See Dansky Opening Report at page 24.) Mr. Dansky even explained that he identified these components after having spoken with Dr. Drabik.

28. The technical papers that Dr. Drabik cites likewise do not identify adaptive frame/field coding as a core H.264 component. One article that both Dr. Drabik and I considered, co-written by JVT co-chairs Gary Sullivan and MMI's Ajay Luthra, lists prediction, transform, quantization, scanning, and entropy coding, but not adaptive frame/field coding.³³ "Scanning" is sometimes considered part of entropy coding and other times listed as a separate

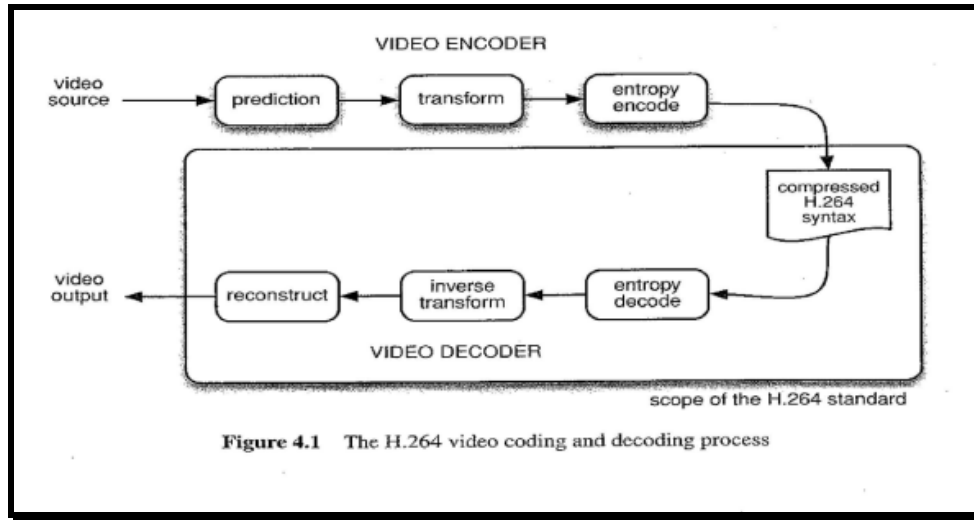
³³ *The H.264/AVC Advanced Video Coding Standard: Overview and Introduction of Fidelity Range Extensions*, SPIE Conference on Applications of Digital ImageProcessing, August 2004 ("Sullivan").

component, so this paper's list of core components is consistent with my list. However, it is not consistent with Dr. Drabik's list because it does not include adaptive frame/field coding as a core component. The figure from this paper is reproduced below:



29. Iain Richardson's H.264 text, also considered by both Dr. Drabik and myself, identifies the core H.264 components as prediction, transform, and entropy coding. (See Iain E. Richardson, The H.264 Advanced Video Compression Standard, at 82.) On page 179, Richardson explains that "transform" includes "quantization." Richardson's list of core components is therefore consistent with mine. However, Richardson never identifies adaptive frame/field coding as a core H.264 component.³⁴ The relevant figure from Richardson is reproduced below:

³⁴ Iain E. Richardson, The H.264 Advanced Video Compression Standard, John Wiley & Sons Ltd., 2003 ("Richardson"), at 82.

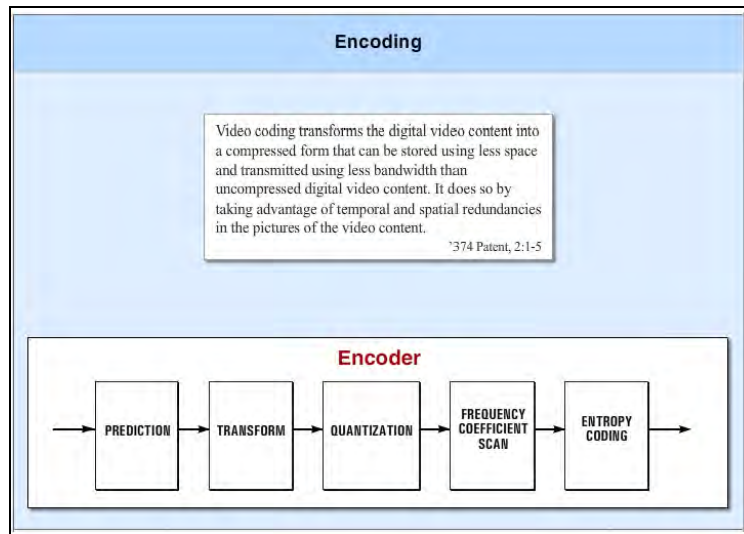


30. Dr. Drabik himself previously testified about the main components of an encoder or decoder. In the patent infringement portion of this litigation, Dr. Drabik submitted a declaration listing the “well-known, basic structural components for decoding encoded digital video content.” He identified prediction, transform, quantization, scanning, and entropy coding:

24	20. A person of ordinary skill in the art would understand that digital video decoders have
25	
26	
1	well-known, basic structural components for decoding encoded digital video content – entropy
	decoding, inverse scanning, inverse quantization, inverse transform and prediction. These

(Drabik Declaration, Case No. 2:10-cv-01823-JLR, Doc. No. 252, filed April 6, 2012, at page 7.)

And in a tutorial for this case, I understand that Dr. Drabik presented the following view of an encoder, where he again listed prediction, transform, quantization, scanning, and entropy coding:



31. (Drabik Tutorial, Case No. 2:10-cv-01823-JLR, March 9, 2012.) In both instances, Dr. Drabik’s list was consistent with my view, but inconsistent with Dr. Drabik’s current position that adaptive frame/field coding is a core component of H.264. Dr. Drabik injected “adaptive frame/field coding” to the list of core H.264 components without any basis. That position is contrary to his prior testimony, his discussions with another MMI expert, and the relevant academic literature.

iii. **If one interprets “basic” as essential, adaptive frame/field coding is not basic**

32. Dr. Drabik’s opening report appears to use “basic” to mean “essential” and “ancillary” to mean “optional.”

6	48. When considering the relative importance of different sections of the H.264
7	Standard, basic features are more important than ancillary features. Without the basic features of
8	H.264, a decoder cannot properly decode H.264-encoded digital video content. Ancillary
9	features, however, might improve the user’s experience with the video content, but the H.264
10	decoder can still operate without these features.

(Drabik Opening Report at ¶ 48.) Even under this definition, Dr. Drabik is incorrect that adaptive frame/field coding is basic. There are many H.264 environments in which adaptive frame/field coding will not be used.

33. As one example, adaptive frame/field coding is never used for progressive video. (H.264 Standard at § 0.6.2.) As I explained in my opening report and will further explain in this report, progressive video content overwhelmingly outpaces interlaced video content in modern usage scenarios. A decoder operating in a progressive video environment can successfully decode video without adaptive frame/field abilities. This is particularly important to Microsoft because content in a computer environment is overwhelmingly, if not exclusively, progressive.

34. As another example, adaptive frame/field coding is never used for decoders implementing the H.264 Baseline profile. Dr. Drabik himself stated that the Baseline profile contains the only features that are mandatory for H.264:

3	69. Constrained Baseline Profile: Certain elements of H.264 are mandatory for all
4	applications and devices used in the H.264 Standard. These base elements include motion
5	compensation, transforms and entropy coding tools. These are contained in the Constrained

35. Dr. Drabik lists motion compensation (i.e., prediction), transform, and entropy coding as examples of these mandatory tools. But adaptive frame/field coding is not mandatory, and therefore not “basic” under Dr. Drabik’s definition.

iv. If one interprets “basic” as essential, than very few of MMI’s patents are “basic”

36. As explained above, Dr. Drabik sometimes appears to use “basic” to mean features required for decoding H.264 content. (Drabik Opening Report at ¶ 48.) Few of MMI’s patents meet this definition because only technologies in the Baseline profile must be used by all H.264 decoders. Dr. Drabik agrees, characterizing Baseline as including the tools “mandatory

for all applications and devices used in the H.264 standard.” (Drabik Opening Report at ¶ 69.) Motorola’s 14 interlaced patents are not included in Baseline and are therefore not required for all H.264 decoders.

37. Tools are included in the Baseline profile if they have substantial upside and little downside for a broad range of usage scenarios. More technically, Baseline includes tools that provide superior compression and quality with low computational complexity across a wide range of applications. The rationale is that tools meeting these criteria might as well be included in all devices – they provide benefit to consumers but add minimal cost to decoder manufacturers.

38. Tools that present tradeoffs, such as providing gains in very specific situations while adding complexity for decoder manufacturers, are excluded from Baseline. One should not be confused by the names of the other profiles – “Main” and “High.” Main and High are neither more important nor “better” because they are named “Main” or “High.” They simply present a different set of tradeoffs as compared to Baseline. Decoder manufacturers can elect to use the Main profile to provide improved performance in certain situations, but this comes at the expense of more complex (and therefore more expensive) decoders. The High profile likewise provides improved performance in certain situations but adds further complexity and expense. Manufacturers consider the scenarios in which their decoders will be used and choose an appropriate profile, balancing consumer benefit and cost. Of all profiles, only Baseline includes features universal to and implemented by every single H.264 decoder.

39. Interlaced coding tools, central to MMI’s patent portfolio, are not in Baseline. (See my opening report, at pages 117-118.) MMI had urged the JVT to include interlaced coding

tools in Baseline. (JVT-C113.) Ten companies³⁵ submitted a proposal with the sole purpose of urging the JVT to exclude interlaced coding from Baseline. (JVT-E056.) Those companies categorically explained that “[t]he applications which intend to use the Baseline Profile of JVT do not require interlaced (field) coding.” (*Id.*) The JVT elected to exclude interlaced coding tools from Baseline. (JVT-E001d1, MOTO_1823_00003013686.)

40. Interlaced coding tools are not essential to H.264 decoding. They are only required for full compliance with Main and High profiles, and even then are only required for video content that is actually interlaced. Fourteen out of the seventeen MMI patents at issue fail to qualify as “basic” under Dr. Drabik’s use of that term as essential.

B. Dr. Drabik overstates the importance of interlaced H.264 content to video coding industries

41. As explained above, fourteen of the seventeen MMI patents at issue that Dr. Drabik analyzed are specific to interlaced video content. Dr. Drabik overstates the importance of interlaced video both in the video coding industry at large and to Microsoft’s products in particular. I will address Microsoft’s products, for which interlaced content is particularly irrelevant, later in this report. This section addresses the video coding industry at large.

42. Dr. Drabik identifies three sources of interlaced H.264 content: television, the Internet, and Blu-Ray. He also identifies hardware components that can potentially function with interlaced content, including USB drives, DVD drives, various exemplary encoders, and set-top boxes. But Dr. Drabik does not provide independent evidence that this hardware is ever actually used with interlaced content. In actuality, interlaced H.264 content has current

³⁵ Apple Computer, Cisco, Conexant, FastVDO, Polycom, Sun Microsystems, Texas Instruments, UBVideo, Videolocus, ViXs

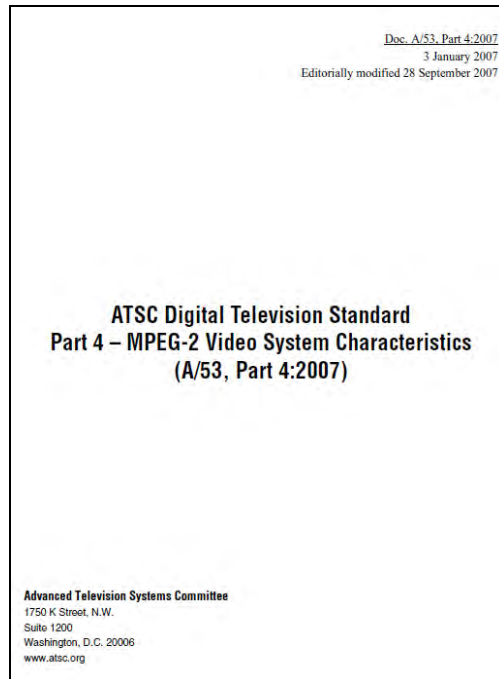
relevance for only one industry: television broadcast. Even there, interlaced content is a dying breed, presaged by television manufacturers that have already stopped selling television sets that display content in interlaced form. The following sections address each of Dr. Drabik's alleged sources of interlaced content.

43. **Television:** Dr. Drabik is correct that the television industry still provides video content in interlaced form. Indeed, television is the only arena where interlaced content still has meaningful relevance. But interlaced video content is likely to become irrelevant to television just as it has become irrelevant to other video coding applications.

44. Dr. Drabik identifies the following examples of digital television and states or suggests that they use H.264 interlaced content: i) ATSC digital television broadcasting (Drabik Opening Report at ¶ 70); and ii) Verizon FiOS and AT&T U-verse digital television services (Drabik Opening Report at ¶ 77, 168). Turning first to ATSC, Dr. Drabik relied on ATSC document A/72, which is not the version of ATSC currently implemented in the United States. According to ATSC's website³⁶, the version adopted by the United States' Federal Communications Commission is document A/53.³⁷ Document A/53 shows that the United States currently uses MPEG-2, not H.264:

³⁶ <http://www.atsc.org/cms/index.php/standards/published-standards/>

³⁷ http://www.atsc.org/cms/standards/a53/a_53-Part-1-6-2007.pdf



45. I explained in my opening report that the United States may later transition to a version of ATSC that implements H.264. Given that such a transition could make current televisions unable to receive over the air broadcasts, there is no guarantee that this conversion will ever happen. But for a current assessment of the importance of H.264 interlaced content, the United States digital television market should be excluded. Moreover, if the United States transitions to H.264 for broadcast, it may very well follow the guidance of the countries that are engineering such a transition and move to progressive television broadcasts. The European Broadcasting Union, the largest association of national broadcasters in the world (<http://www.eurovision.net/about/ebu.php>), after much investigation has decided that future broadcast systems including those that use H.264 coding should use progressive, not interlaced, video. (See, e.g., European Broadcasting Union, High Definition for Europe – a progressive approach, available at http://tech.ebu.ch/docs/techreview/trev_300-wood.pdf, at 5) (“The future broadcast chain will begin and end with progressive scanning”). Indeed, the question is now which progressive format to use. (*Id.* at 1) (“The balance of evidence suggests that the public

interest will best be served by using a progressively-scanned delivery channel. Evidence about which progressive format would be optimum for the EBU environment has also been gathered, and is discussed in the article.”)

46. Even if one examines the ATSC version that Dr. Drabik considered, ATSC’s use of interlaced video is not cut and dry. ATSC document A/72 allows for the compression formats shown in the table below. I have added a red box around the formats that are considered “High Definition” and highlighted in yellow the formats that are progressive.

Table 6.3 Compression Format Constraints

Vertical Size	Horizontal Size	PicWidth In Mbs	PicHeight In Mbs	aspect_ratio_idc	profile_idc ¹	level_idc	Display Aspect Ratio	Allowed Frame Rates	Progressive/interlaced
1080	1920	120	68	1	100	40	16:9	1,2,3,4,7	P
1080	1920	120	68	1	100	42	16:9	5,6,8	P
1080	1920	120	68	1	100	40	16:9	3,4,7	I
1080	1440	90	68	14	100	40	16:9	1,2,3,4,7	P
1080	1440	90	68	14	100	42	16:9	5,6,8	P
1080	1440	90	68	14	100	40	16:9	3,4,7	I
720	1280	80	45	1	100	32, 40	16:9	1,2,3,4,5,6,7,8	P
480	720	45	30	3	77 or 100	31, 40	4:3	1,2,3,4,5,6,7,8	P
480	720	45	30	5	77 or 100	31, 40	16:9	1,2,3,4,5,6,7,8	P
480	720	45	30	3	77 or 100	30	4:3	3,4,7	I
480	720	45	30	5	77 or 100	30	16:9	3,4,7	I
480	704	44	30	3	77 or 100	31, 40	4:3	1,2,3,4,5,6,7,8	P
480	704	44	30	5	77 or 100	31, 40	16:9	1,2,3,4,5,6,7,8	P
480	704	44	30	3	77 or 100	30	4:3	3,4,7	I
480	704	44	30	5	77 or 100	30	16:9	3,4,7	I
480	640	40	30	1	77 or 100	31, 40	4:3	1,2,3,4,5,6,7,8	P
480	640	40	30	1	77 or 100	31, 40	4:3	3,4,7	I
480	544	34	30	5	77 or 100	30	4:3	1,7	P
480	544	34	30	5	77 or 100	30	4:3	3,7	I
480	528	33	30	5	77 or 100	30	4:3	1,7	P
480	528	33	30	5	77 or 100	30	4:3	3,7	I
480	352	22	30	7	77 or 100	30	4:3	1,7	P
480	352	22	30	7	77 or 100	30	4:3	3,7	I
240	352	22	15	3	66 or 77	30	4:3	1,7	P
120	176	11	8	3	66 or 77	11	4:3	1,7	P

Legend:
frame rate: 1 = 23.976 Hz, 2 = 24 Hz, 3 = 29.97 Hz, 4 = 30 Hz, 5 = 59.94 Hz, 6 = 60 Hz, 7 = 25 Hz, 8 = 50 Hz
aspect_ratio_idc: 1 = 1:1 [square samples], 3 = 10:11, 5 = 40:33, 7 = 20:11, 14 = 4:3

Footnote:
¹ A compliant bitstream may have a profile_idc value of either 77 or 100.

47. (See ATSC Standard: Video System Characteristics of AVC in the ATSC Digital Television System, Document A/72 Part 1, 29 July 2008.) Under ATSC, video content providers

can choose any one of these formats. There is no requirement that the content providers use interlaced video. In fact, at the 720 level, content providers must use progressive. Dr. Drabik's report does not indicate the extent to which broadcasters use interlaced formats as compared to progressive.

48. Dr. Drabik further cites websites about the Verizon FiOS and the AT&T U-verse digital television services. The websites indicate that Verizon FiOS broadcasts in two HD formats: 720p and 1080i.³⁸ The FiOS website does not indicate which is more common.³⁹ Moreover, Dr. Drabik does not contend that FiOS is used with any Microsoft product and FiOS cannot be used with Windows-based PC's. I will examine Dr. Drabik's assertions regarding AT&T U-verse in detail later in this report because Dr. Drabik contends that this service is relevant to the Microsoft Xbox.

49. As the availability of bandwidth continues to increase, 1080p will likely become the default standard for television. The websites that Dr. Drabik cites for FiOS and U-verse explain that 1080p provides superior quality than 1080i. For example, the U-verse website says "Full HD means that the TV has the capability to display a 1080p signal and to upscale lower resolution signals such as 720p and 1080i to 1080p-quality pictures on your TV screen."⁴⁰ Just as 720i does not exist, 1080i will likely become obsolete as well. The ATSC standard on which Dr. Drabik relies includes a 1080p format for that reason: ATSC must have contemplated that

³⁸ The "p" and "i" suffixes after the numbers indicate whether the resolution refers to progressive capture or interlaced capture, respectively.

³⁹ <http://www22.verizon.com/support/residential/tv/fios/tv/troubleshooting/onscreen+menus/questionsone/123952.htm>

⁴⁰ <http://techtips.salon.com/att-uverse-broadcast-1080p-21924.html>

improvements to computing and network technology will ultimately compel broadcasters to use 1080p. One of the websites that Dr. Drabik himself relies on, from Ambarella, shows that 1080p is emerging:⁴¹

AmbaCast™ a family of high-performance products

The Ambarella AmbaCast™ processors can support both standard definition and high-definition with high- definition being 720p 60 (favored by sport programmers), 1080i 60, and the emerging 1080p 60. The AmbaCast™ platform accepts uncompressed video at rates exceeding 3Gbits

50. The television set industry has already foreshadowed the demise of interlaced broadcasting by virtually abandoning the sale of televisions that display in interlaced form. As I explained in my opening report, some older televisions displayed content in interlaced form. When those televisions received video in progressive form, they converted the progressive content into interlaced form. If the video content entering the television is predominantly progressive, it makes more sense for the television to simply display in progressive format, obviating the need to convert the content from one form into another. Recognizing that interlaced content will become increasingly rare, television manufacturers rarely sell interlaced television sets. I conducted a search on Amazon.com for televisions and observed that televisions with interlaced displays were not even an option.⁴²

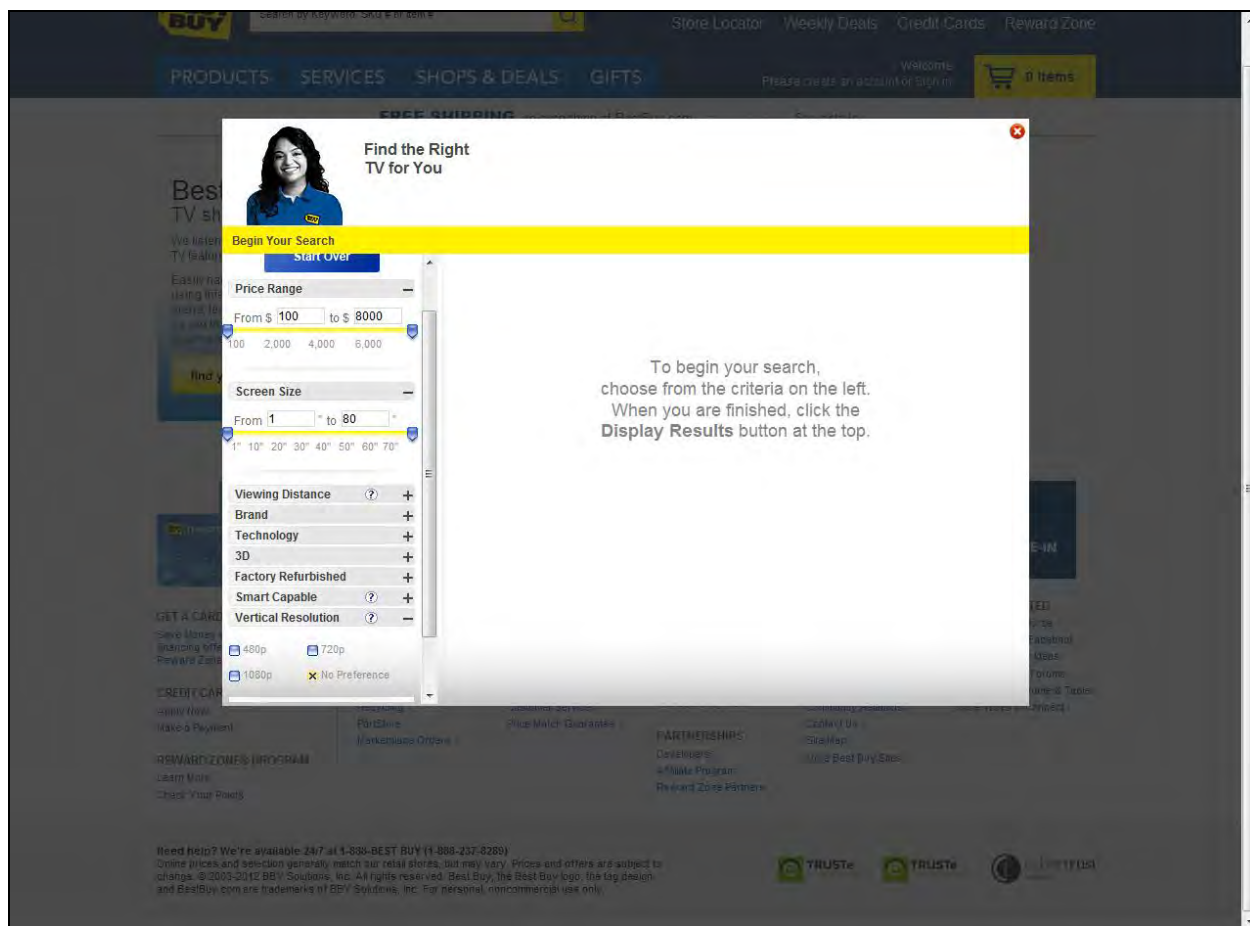
⁴¹ <http://www.ambarella.com/news/3/74/Ambarella-AmbaCast-platformselection-for-H-264-broadcast-tops-10-000-channel-milestone.html>

⁴² http://www.amazon.com/s/ref=sr_nr_n_12?rh=n%3A172282%2Cn%3A%21493964%2Cn%3A1266092011%2Cn%3A172659&bzn=1266092011&ie=UTF8&qid=1343754664&rmid=1266092011



51. I also searched Best Buy's website. The Best Buy "Find your TV" feature allows consumers to narrow searches for new TV's based on resolution. The only choices were progressive formats of 480p, 720p, and 1080p:⁴³

⁴³ <http://www.bestbuy.com/site/Global-Promotions/TV-Finder/pccat196100050004.c?id=pccat196100050004#>



52. Dr. Drabik is correct that the television industry still provides video content in interlaced form. But interlaced video content is likely to become irrelevant for television industry just as it has become irrelevant to other video coding applications.

53. **Internet:** Dr. Drabik states that the Internet is a source of interlaced H.264 content, but the examples that he cites underscore the rarity of that content. Dr. Drabik identified two examples of interlaced video content on the Internet. The first is a video from the musician Katy Perry that Dr. Drabik downloaded from the Pirate Bay website. Pirate Bay is a Swedish website used largely for illegal file sharing whose founders have been sentenced to jail by Swedish authorities.⁴⁴ The video appears to have been pirated from a television broadcast in

⁴⁴ <http://www.csmonitor.com/Innovation/2009/0417/pirate-bay-founders-convicted-by-swedish-court>

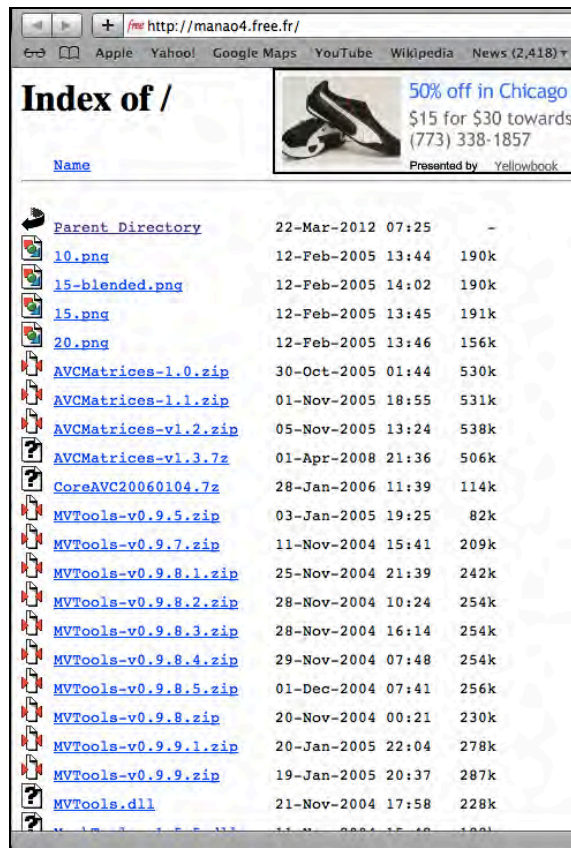
which Katy Perry performed her single *Part of Me* on the (British) BBC One television channel.⁴⁵ A screen capture of this video is shown below. This example of alleged interlaced “Internet” content is not actually Internet content, but rather a video pirated from British television and distributed illegally on the Internet. Playback of pirated content is not commercially relevant to Microsoft.



54. The second example that Dr. Drabik cites is <http://www.findthatfile.com/search-1094023-hMP4/video-download-interlaced-mbaff.mp4.htm>. Findthatfile is an internet file search service that allows individuals to search the Internet for files that are hosted on other websites. Findthatfile includes information on where the file returned by the search result exists. In the case of the video cited by Dr. Drabik, I followed that source to a French website called

⁴⁵ <http://www.bbc.co.uk/mediacentre/latestnews/2012/katy-perry.html> (this article is dated March 12, 2012, and the Pirate Bay video was uploaded March 20, suggesting the article is likely about the same performance as the Pirate Bay video).

<http://manoa4.free.fr>. That site does not appear to provide these videos for any commercially relevant purpose but rather is just a repository of files.



55. The video file that Dr. Drabik cited is a two second video clip of what appears to be a talk show, a screenshot of which appears below:



56. I do not know the source of this video, but it appears this video may also have been recorded from a television broadcast and then later copied onto a computer for file sharing. I do not know why the manao4.free.fr website placed a copy of this video into its directory structure. I suspect that certain individuals in France may have been working on video splicing. “Video splicing” refers to the technique of taking multiple video clips, perhaps encoded through different mechanisms, and combining them into one continuous video sequence. The individuals may have been attempting to test whether its video splicing software would work with various types of content, including interlaced MBAFF-encoded content. For that reason, they appear to have obtained (from a location unknown to me) an MBAFF-encoded video clip, named it “video-download-interlaced-mbaff.mp4,” and included it among their test materials. This alleged example of interlaced video content is purely academic and has no commercial relevance to the Internet whatsoever.

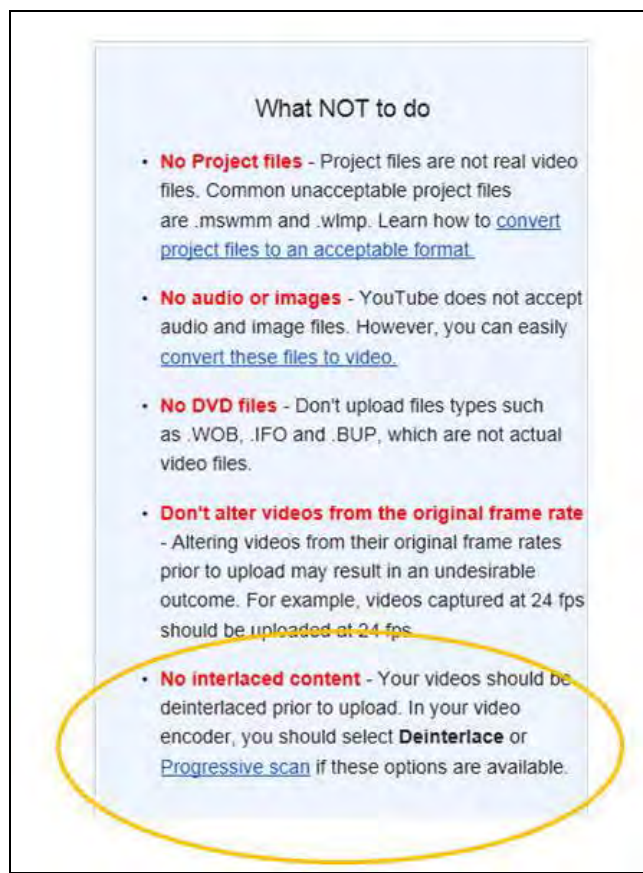
57. And with this clip, one can see a reason why interlaced video content is not suitable for computer display. The woman in the video clip is moving. Owing to that motion, her profile has a jagged boundary, which is an artifact of interlaced capture.

58. Finally, Dr. Drabik identified video files available at http://wftp3.itu.int/av-arch/jvt-site/draft_conformance/ having the extension .26l. He identified the file CAMP_MOT_MBAFF_L30.26l (MOTM_WASH1823_0420057). I directed someone having a PC running Windows 7 to play this file. The file did not play. If Dr. Drabik was able to watch this video file on a PC running Windows 7, I think a codec other than one provided by Microsoft software may have performed the decoding. In any event, this example is purely academic. These files are old JVT conformance testing files, not files used for any commercial purpose.

59. Dr. Drabik did not identify any other examples of interlaced videos on the Internet. This is for good reason: Internet content is typically viewed on computer screens and mobile devices, for which interlaced content is not suitable. This has been known for decades.⁴⁶ In fact, none of the websites that MMI's own experts identify as the basis for H.264's popularity provide interlaced content. For example, both Dr. Drabik and Mr. Dansky identify YouTube. (Drabik Opening Report at page 25; Dansky Opening Report at page 25.) YouTube expressly prohibits interlaced content⁴⁷:

⁴⁶ See, e.g., Haskell, et al., Digital Video: An Introduction to MPEG-2, at 82 (noting that computer displays are progressive rather than interlaced to avoid "annoying large area flicker, interline flicker, line crawling, and other problems").

⁴⁷ <http://support.google.com/youtube/bin/static.py?hl=en&guide=1728585&page=guide.cs>



60. According to one of the articles that Dr. Drabik relies on, YouTube alone makes up 40% of the web's video content.⁴⁸ Dr. Drabik also cites an article that lists Adobe Flash, HTML5 Canvas, and support from Apple as the basis for H.264's popularity. (Drabik Opening Report at page 25.) All these examples confirm that interlaced content has no place on the Internet. For Flash, Adobe discourages interlaced video.⁴⁹

⁴⁸ <http://techcrunch.com/2010/05/01/h-264-66-percent-web-video/>

⁴⁹ Video Encoding Cookbook and Profile Guidelines for the Adobe Flash Platform, at page 29, available for download after fee registration at <http://www.adobe.com/devnet/video/encoding.html>.

Deinterlacing Content

When content is produced for broadcast, interlacing is used to improve motion fidelity and reduce required bandwidth to push through the highest possible picture quality to the display device. This is a standard technique in broadcast; in web video it is not — deinterlaced or progressive video is used for web delivery. Computer monitors are not designed to display interlaced content, so interlacing is unnecessary and can create artifacts, thus it is not advisable to have content remain interlaced for web delivery. If your source content is interlaced, it is advised that a method of motion compensated or motion adaptive deinterlacing be applied prior to any other operation.

And in any event, Flash does not decode H.264 content using Microsoft decoders. Adobe software supplies its own decoder for Flash. (See

<http://www.adobe.com/support/documentation/en/flashplayer/9/releasenotes.html>;

<http://www.adobepress.com/articles/article.asp?p=1381885&seqNum=2>.)

61. HTML5 Canvas is simply a mechanism to include video within a webpage, whether that video was encoded using H.264 or using another video codec. I do not believe any web developers would use HTML5 to incorporate interlaced video content into web pages. And Apple could not have been clearer to the JVT in its opposition to interlaced coding tools during H.264 development:

We believe that interlace should be removed from the Baseline profile for the following reasons:

a) displaying interlaced content in progressive environments is painful. This includes PCs, PDAs, and the like. The picture quality is adversely affected, and the hardware complexity is onerous. The visual tearing and so on that happen with simple de-interlace is objectionable to watch.

b) Interlace is a dreadful 'compression' technology left from the 1930s, used solely to reduce the bandwidth of the signal. It's time to move beyond it.

c) High-end customers also abhor it (e.g. DCinema). The deleterious effects of interlace on moving, detailed areas, such as scrolling text, ought to be completely unacceptable in this day and age.

d) Many cameras across the spectrum either can do progressive (e.g. DV cams) or only do progressive (e.g. webcams), up into Pro equipment.

e) Interlace is a tool that should be defined by profile, not level, and as it is clear that major segments of the industry would like a profile where they can operate at any resolution without having to handle interlaced signals, it ought to be out of baseline.

f) when progressive material is interlaced and telecined, it is quite hard to reverse the process, and it becomes nearly impossible if the interlaced material is then edited (as this destroys the pulldown pattern)

For these and other reasons, we strongly oppose the inclusion of interlace in the baseline standard.

(JVT-E140.)

62. MMI's economics experts Michael Dansky also identified the Vimeo video website as supposedly showing the importance of H.264. (Dansky Opening Report at pages 25, 99-100.) Vimeo discourages interlaced content as well⁵⁰:

Deinterlacing: Maybe

If you are shooting on an older camera, enable the deinterlacing option. Otherwise, you may get weird-looking horizontal lines in your video. With newer camera models, deinterlacing shouldn't be an issue, so you can leave this option unchecked.

⁵⁰ <http://vimeo.com/help/compression>

63. The Vimeo website is saying that newer cameras use progressive capture and therefore are suitable for Vimeo. Older cameras use interlaced capture, meaning “you may get weird-looking horizontal lines” and thus you would need to deinterlace the video content before uploading to Vimeo. Deinterlacing refers to removing the interlacing and converting the video to a progressive format. As a practical matter, Vimeo is instructing its users not to use interlaced content.

64. Moreover, other commercially popular video distribution websites that I investigated, such as Hulu, provide video content only in progressive form.⁵¹ Aside from academic examples, such as the two videos cited by Dr. Drabik, interlaced video content is not used on the Internet.

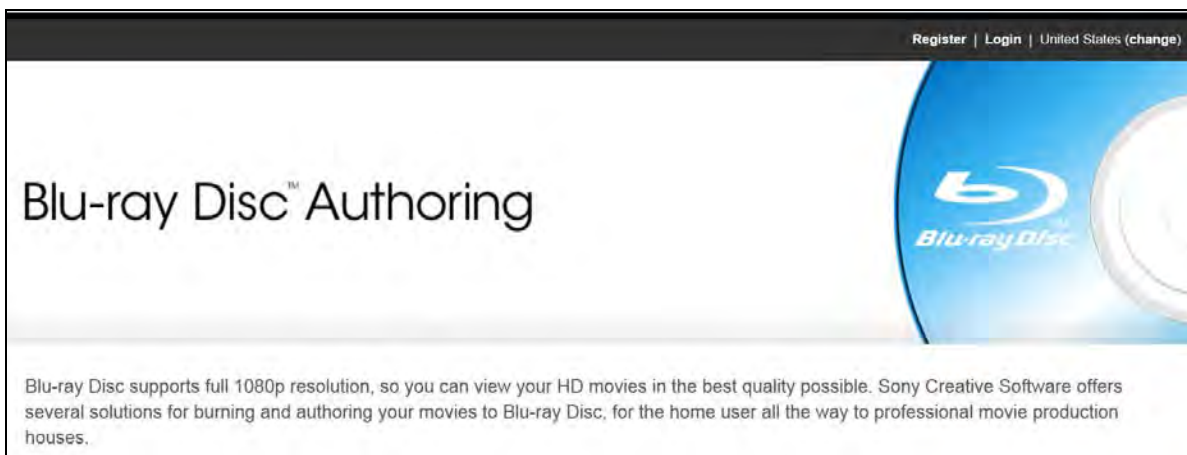
65. **Blu-ray:** Dr. Drabik asserts that Blu-ray players are capable of decoding interlaced video content. (Drabik Opening Report at ¶ 83, 274.) The most commercially relevant Blu-ray discs are not coded in interlaced format. Dr. Drabik identifies two relatively obscure movies called *Monster Brawl*⁵² and *The River Why*⁵³. In actuality, Blu-ray DVDs are overwhelmingly coded as progressive. Sony’s Blu-ray authoring website touts Blu-rays 1080p progressive format.⁵⁴

⁵¹ <http://www.pcmag.com/article2/0,2817,2366593,00.asp> (listing 288p, 360p, 480p, and 720p)

⁵² Amazon Best Sellers Rank: #56,677 in Movies & TV (http://www.amazon.com/Monster-Brawl-Blu-ray-Dave-Foley/dp/B006IXRKT2/ref=sr_1_2?ie=UTF8&qid=1343694754&sr=8-2&keywords=monster+brawl)

⁵³ Amazon Best Sellers Rank: #24,307 in Movies & TV (http://www.amazon.com/River-Why-Zach-Gilford/dp/B005FXXTIW/ref=sr_1_1?s=movies-tv&ie=UTF8&qid=1344358261&sr=1-1&keywords=river+why)

⁵⁴ <http://www.sonycreativesoftware.com/blurayauthoring>



66. With authoring tools capable of rendering video using progressive format and Blu-ray players capable of decoding progressive format, there is little reason for content providers to create interlaced video. My review of the Blu-ray database confirms this. Blu-ray.com includes a database of information about various Blu-ray discs, including their resolutions. The database shows that virtually all popular Blu-rays are encoded in progressive form. As an initial matter, Blu-ray.com indicates that *Monster Brawl* is not interlaced.⁵⁵ Perhaps Dr. Drabik was mistaken or perhaps his copy of *Monster Brawl* is an older version that was encoded in a different format. In any event, I went to the “Top sellers” link at Blu-ray.com and viewed the encoding resolution for the first 60 Blu-rays.⁵⁶ Every single one of the first 60 were encoded in progressive form except for one: “Planet Earth” (#39). *See* [MS-MOTO_1823_00005238974 - MS-MOTO_1823_00005239195].⁵⁷ Interlaced video coding is not important to Blu-ray.⁵⁸

⁵⁵ <http://www.blu-ray.com/movies/Monster-Brawl-Blu-ray/34773/> (listing 1080p).

⁵⁶ <http://www.blu-ray.com/movies/top.php>

⁵⁷ I did not test *Planet Earth* to check whether viewing that movie requires practicing the Motorola patents.

⁵⁸ Blu-ray.com allows one to search its database based on resolution and codec. In a search I conducted on August 10 among H.264-encoded Blu-rays, I found more than 4600 progressive entries and less than 800 interlaced entries.

67. ***Hardware allegedly capable of functioning with interlaced content:*** Dr. Drabik also cites, as evidence on the use of interlaced video, various hardware components that are capable of operating with interlaced video. For example, Dr. Drabik cites encoders manufactured by Cisco, Thomson, Grass Valley Mustang, Sencore, Rovi, and VMC, as well as set-top boxes manufactured by MMI. (See, e.g., Drabik Opening Report at ¶¶ 75, 170-171.) Dr. Drabik asserts that “many encoder manufacturers include adaptive frame/field coding in their encoders and advertise it as a feature.” (Drabik Opening Report at ¶ 170.)⁵⁹ I reviewed the datasheets, websites, and white papers that Dr. Drabik cited and disagree with his characterization that all of these encoder manufacturers “advertise” adaptive frame/field coding as a feature. Rather, these manufacturers list adaptive frame/field coding as one supported feature among many others. Indeed, because adaptive frame/field coding was pushed into certain H.264 profiles, components that comply with those profiles will likely support adaptive frame/field coding. That does not mean those components are actually used to encode or decode interlaced content, nor does it indicate the relative frequency with which those decoders encounter interlaced content. Nor does it indicate any value of interlaced decoding other than whatever value it gets from having been included in the standard. In fact, before the ITC, Dr. Drabik testified about the family of MMI set-top boxes that he cited in his expert report and he acknowledged that he has no idea whether anyone has ever used MMI’s set-top boxes to decode interlaced content other than himself, using a video clip given to him by MMI’s lawyers:

The interlaced entries were generally not popular commercial movies, but rather concerts and video content that was originally created for television.

⁵⁹ Dr. Drabik generally makes these claims for the MBAFF and PICAFF features of H.264, both of which only apply for interlaced video content.

23 Q You played content on the VIP12XX you said?

24 A Yes.

25 Q And that content was provided to you by

1 Motorola's counsel?

2 A Yes. It was the same -- the very same clip.

...

21 Q So I believe you testified that the VIP12XX

22 can decode interlaced content, right?

23 A Yes.

24 Q Are you aware of anybody using it to decode

25 interlaced content?

1 A Not specifically, I know that I did.

2 Q Other than you?

3 A Not specifically.

(Drabik Trial Testimony, ITC Inv. No. 337-TA-752, at pp. 611-613.)

68. ***Other sources of H.264 content identified in Dr. Drabik's report:*** I have reviewed the examples of H.264 content that Dr. Drabik cited in his expert report. (*See, e.g.*, Drabik Opening Report at ¶ 75.) Other than certain digital television settings, such as those discussed above, I do not believe interlaced content is relevant to any of Dr. Drabik's examples. Certainly, Dr. Drabik has not provided any evidence that interlaced content is used in any meaningful way in any of the settings that he cites.⁶⁰

⁶⁰ I note that Dr. Drabik listed "DVD" as a source of H.264 content on page 25 of his report, without citation. His lack of citation is likely because DVD's do not use H.264. *See, e.g.*, <http://mpeg.chiariglione.org/> (identifying MPEG-2 as standard for DVD technology).

C. Dr. Drabik overstates the role of MMI employees in the development of H.264

69. Dr. Drabik concluded that “Motorola’s employees were actively involved in the development of the H.264 Standard.” (Drabik Opening Report, ¶ 46.) That conclusion overstates those employees’ contributions and requires several important qualifications. First, as I explained in my opening report, MMI’s employees were minimally involved in the VCEG meetings that took place before MPEG merged with VCEG in order to create the JVT. (My opening report at pages 83-86, 128.) MMI sent few representatives to VCEG’s meetings, was absent from several meetings, and did not offer any H.264-related contribution documents to VCEG. By the time MMI joined the process, many of H.264’s distinguishing features were in place. (My opening report at pages 86-87.) Dr. Drabik, in paragraph 39 of his report, includes a passing reference to the document that described these features, but does not mention that MMI played no role in its creation.

70. Only after MPEG recognized H.264’s improved performance and elected to join VCEG did MMI begin playing an active role in JVT. Even then, its role was cabined to interlaced coding tools. Every MMI contribution document that Dr. Drabik cited in his report focused on interlaced coding tools. (Drabik Opening Report at ¶ 47.) That small handful of documents, all focused on specific aspects of interlaced coding, do not represent a significant portion of the voluminous quantity of overall contributions to H.264.

71. Dr. Drabik appears to equate the roles of Dr. Sullivan and Dr. Luthra in H.264 development. That is not accurate. Before MPEG joined with VCEG, Microsoft’s Gary Sullivan was the sole Chair and Rapporteur of VCEG. After the merger, Dr. Ajay Luthra became a co-chair of JVT because the “Terms of Reference” guiding MPEG’s merger with VCEG called for Dr. Sullivan to be joined by a co-chair from MPEG.

6.0 Management

The management of the J-VCEG will consist of a Rapporteur/Chair (Gary Sullivan) and two Associate Rapporteurs/Co-Chairs (one each as appointed from SC 29/WG 11 and SG16 with joint consent), reporting to ITU-T SG16 WP3 and ISO/IEC JTC 1/SC 29/WG 11. Changes in the management team must be agreed by both organisations.

(VCEG-N87.) Contrary to Dr. Drabik's characterization in ¶ 46 of his report, Dr. Sullivan was generally considered a "chairman" and Dr. Luthra was considered a "co-chair" or "associate chair." *See, e.g.*, JVT-A005 (MS-MOTO_1823_00002972071); JVT-AA200 (MS-MOTO_1823_00003626502); JVT-AE200 (MS-MOTO_1823_00003662093); (MS-MOTO_1823_00003056142).

72. Finally, Dr. Drabik ignored the contributions of all other companies in H.264 development. It is not possible to understand how MMI's contributions fare in comparison to all other contributions without reviewing the source VCEG and JVT documents and meeting minutes. Dr. Drabik's report did not consider MMI's contributions in this context. By way of example, Dr. Drabik did not mention many of H.264's important features and did not attempt to identify who was responsible for those features. As I explained in my opening report, these features include multiple reference frames, weighted prediction, direct mode, multiple block sizes (as small as 4x4), quarter pixel motion vectors, improved estimation of fractional pixel values, the ability for B-frames to select both reference frames in the same temporal direction, spatial prediction, 4x4 integer transform, quantization parameters, CAVLC entropy coding, and CABAC entropy coding. Many companies (not including MMI) submitted contributions making these features possible. (*See* my opening report at pages 98-117). And if one considers the many additional incremental improvements made to H.264, one would need to include literally hundreds of contributions. Dr. Drabik's analysis of MMI's contributions was out of context and therefore incomplete.

D. Dr. Wang's memorandum from the 12th VCEG Meeting

73. I understand that after I submitted my opening report, MMI produced a memorandum that Dr. Limin Wang wrote regarding his attendance at VCEG's 12th Meeting. *See* MOTM_WASH1823_0603550. Dr. Wang's memorandum supports many observations I made in my opening report. For example, Dr. Wang identifies certain "unique" tools used by H.26L: UVLC/CAVLC entropy coding, different block sizes for motion compensation, multiple reference frames, 4x4 integer transform, and intra prediction modes. Dr. Wang's memo posits that 4x4 integer transform and UVLC offer questionable gain, although I do believe that both 4x4 integer transform and entropy coding (both CAVLC and CABAC), as adopted, are important to H.264's improved performance. Dr. Wang also observed that "some of early [sic] and key contributors to H.261, H.263 and H.26L, such as Telenor, Norway, gave their technology ideas along [with software] (such as H.263 and H.26L codes) to ITU for free."

74. Dr. Wang acknowledged in the memo that "VCEG did very good job on developing a long-term video coding standard, and its H.26L TML indeed achieves much better performance than other existing video coding standards, such as H.263, MPEG4, etc." Dr. Wang goes on to explain that there "is a lot of work ahead" for H.264 and lists 8 areas of proposed future work. The items he listed are generally incremental as compared to the unique ideas that had already been established within H.26L. This memo was written before MMI had made any substantive contributions to H.264. (*See* my opening report at pages 130-143.) Moreover, after MMI joined JVT, MMI did not offer any substantive contributions to any of the 8 areas that Dr. Wang listed. Instead, MMI offered contributions solely directed to interlaced coding tools (and, much later, wavelet coding tools for which MMI does not claim any patents).

75. Finally, I note that Dr. Wang's memo appears to express hesitancy over VCEG's policies regarding intellectual property rights. Dr. Wang observed:

During the meeting, Siemens proposed that all the attendants sign a paper on IPR so that the technologies and SW can be shared freely. It could be an issue again next meeting. Hence, we need to be prepared.

E. Dr. Luthra's submission to HVEC

76. I understand that MMI recently produced a submission from its employee, Dr. Ajay Luthra, to the JVT in connection with the JVT's current efforts to develop the HEVC video coding standard. (MOTM_WASH1823_0603553.) Dr. Luthra's document confirms my understanding that the only domain in which interlaced video content has any continued relevance is television broadcasting, an area of exceedingly marginal commercial relevance to a company like Microsoft. Dr. Luthra's submission does not assert that interlaced video content has any use or relevance for computers, smartphones, tablets, devices like Xbox, or any other devices other than televisions.

77. Moreover, a significant portion of the video content Dr. Luthra describes in his document is unrelated to H.264. He cites a variety of television broadcast mediums. But "over the air" broadcast in the United States does not use H.264, and the extent to which cable or satellite providers use H.264 will vary from one provider to the next. In any event, Microsoft does not sell television sets.

78. Dr. Luthra also explains that interlaced support is important because archives include 50 years worth of interlaced television content and even more content originally on film that was converted to interlaced form. But H.264 has only been around for about 10 years. The vast majority of the content that Dr. Luthra describes will have been archived in non-H.264 formats, such as MPEG-2, making the content irrelevant to this litigation. If it is re-encoded in H.264 for re-use on one of Microsoft products, it would likely be encoded in progressive form.

79. Finally, Dr. Luthra explains that interlaced coding is important for consumers who continue to have legacy, interlaced-display television sets. Microsoft software is intended

for progressive computer monitors. As for televisions, interlaced televisions are almost never sold.

IV. THE VALUE OF MMI'S PATENTS TO H.264

A. MMI's patents are not significant to H.264

i. Overview

80. MMI's seventeen patents at issue break down as follows.

Fourteen patents are limited to interlaced coding tools. Interlaced video has no current relevance to H.264 other than lingering use for television broadcast.

Eight of these patents cover just one feature: MMI's version of MBAFF. MMI obtained one patent directed to this feature (the '596 patent) and then filed for and obtained seven other patents claiming this feature in combination with other features that MMI did not invent. Another version of MBAFF existed and could have been used by the JVT.

Three cover just one feature: PICAFF as used in combination with specific H.264 features. MMI neither invented PICAFF nor the other H.264 features, but rather filed patents claiming their combination. Other alternatives could have been used by JVT, as I explained my opening report and will reiterate below.

Two cover an alternate scan for which virtually equivalent alternatives were available to the JVT. In fact, available data suggests that these alternatives provided better results than Motorola's alternate scan.

One purports to claim an algorithm for using three neighboring blocks to predict the motion vector for a given block. MMI copied this algorithm, including the exact three neighbors that one should use, from the prior art H.263 standard and added a claim limitation narrowing the patent's scope to interlaced video. Other alternatives could have been used by JVT, as I explained my opening report and will reiterate below.

Three patents are not limited to interlaced video.

One is expired and has claims that likely exclude Microsoft's software decoders from their scope.

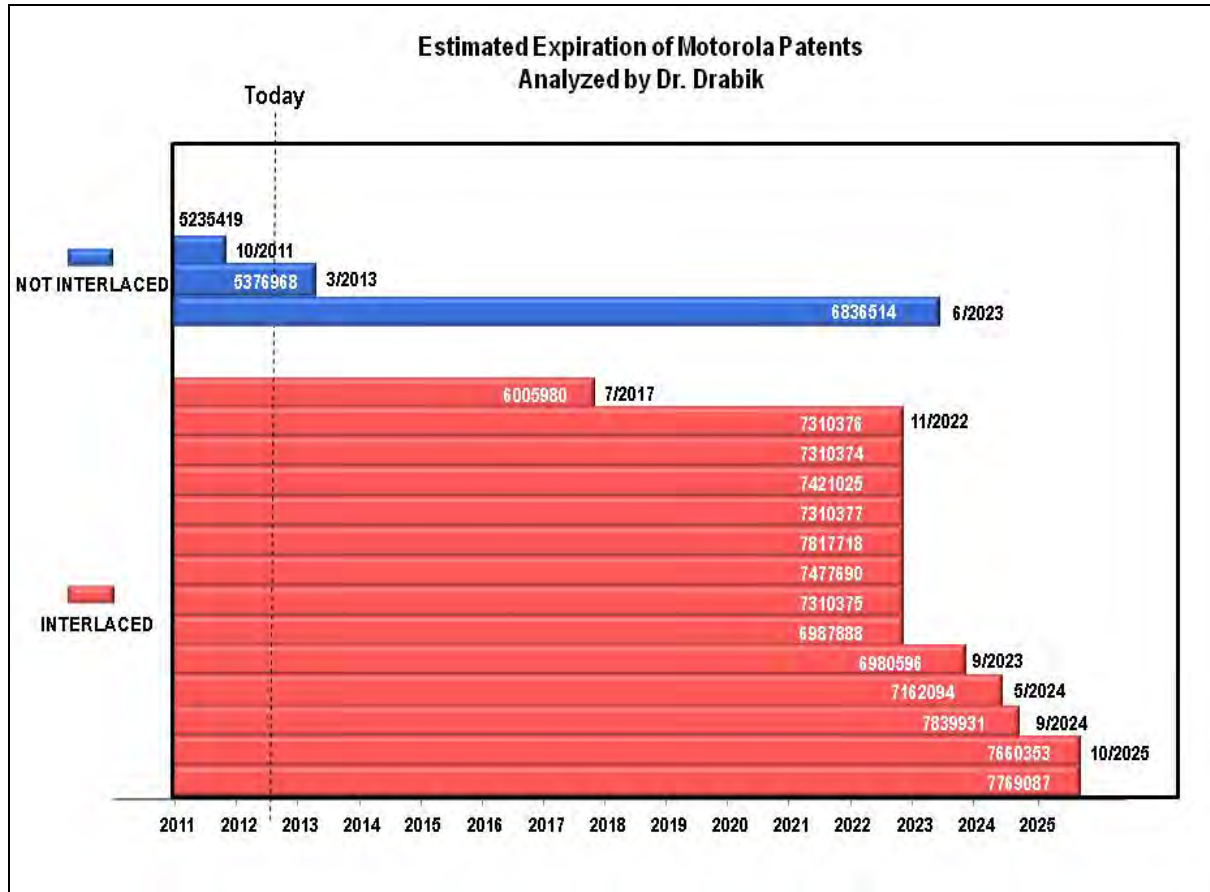
One is almost expired and has claims that likely exclude Microsoft's software decoders from their scope.

One is not practiced by H.264 devices at all.

ii. **Expiration dates show that MMI's entire patent portfolio has almost no value for progressive video content**

81. The graph below, which was created at my direction, shows the estimated expiration dates of the seventeen MMI patents at issue. I understand that the graph below factors

in considerations that can alter the term of a patent from its default term, such as patent term extensions and terminal disclaimers. As can be seen, MMI has only three patents that are not specific to interlaced coding (“MMI’s non-interlaced patents”). Of these three, the ‘419 patent is expired and does not cover software, the ‘968 patent will expire early next year and does not cover software, and the ‘514 patent is not used by H.264.



82. As I have already explained, interlaced video content is irrelevant to most video coding industries and will over time become irrelevant to its only remaining bastion, television broadcast. And television broadcast is not relevant to Microsoft’s products. Given the impending expirations of MMI’s only patents not specific to interlaced video, MMI’s patent portfolio has extremely limited value to Microsoft.

iii. MMI’s specific patent families

a. **US Patent No. 5,235,419: The Krause “adaptive block size” family**

(i) **Dr. Drabik does not properly analyze the Puri alternative to the Krause patent**

83. Dr. Drabik’s expert report contends that there were two alternatives to the use of MMI’s Krause patent: eliminating the use of multiple block sizes entirely, and a prior art implementation set forth by Puri in a November 1987 article called “Interframe coding with variable block-size motion compensation.” (Drabik Opening Report at ¶¶ 97-98, citing MOTM_WASH_0602838-842.) Eliminating the use of multiple block sizes is not an appropriate basis for comparison because adaptive block sizes were in the prior art and could have been adopted by the JVT. I identified many such references in my opening report (*see* my opening report at pages 188-191) and discuss some of these references in more detail below.

84. Puri provided motion compensation using multiple block sizes. But Dr. Drabik never attempts to explain whether MMI’s implementation would provide any benefit as compared to Puri. Puri discloses an algorithm in which an initial motion compensation is performed on an image using large block sizes. (Puri at 1.) Next, Puri’s algorithm focuses further on the large blocks for which the motion compensation performed poorly. Puri’s algorithm breaks those large blocks into smaller blocks and again applies motion compensation to the smaller blocks. (Puri at 1.) The Puri algorithm does not bother breaking up the large blocks that performed well during the initial motion compensation on the basis that smaller blocks for those regions would add little performance gain while adding complexity and overhead. (Puri at 1.)

85. Dr. Drabik alludes to one distinction between Puri’s implementation and the Krause patent: that Puri implements its two motion compensation methods in cascade, invoking the second method only in certain situations, whereas the Krause patent compares both block

sizes in all situations. (Drabik Opening Report at ¶ 98.) This difference is unlikely to result in a significant difference. Puri's approach does not bother with small block sizes for regions where large block sizes have already performed well. Testing the use of small blocks for those regions would be unlikely to provide meaningful additional gain. Moreover, testing the use of small blocks would add complexity for encoder manufacturers. Although Dr. Drabik identified Puri as an alternative, he failed to show why MMI's patent provides any benefit as compared to Puri.

(ii) **The Krause patent provides no value to decoder manufacturers**

86. The Krause patent is relevant for encoder manufacturers, not decoder manufacturers. The claims require blocks of data "provided by different motion compensators depending on which motion compensator meets a selection criteria for a particular region of a video image... ." (Drabik Opening Report at ¶ 93.) That selection would be performed by an encoder, as Dr. Drabik himself agrees. (Drabik Opening Report at ¶ 89.) The responsibility of a decoder is to decode video content containing all possible block sizes used by the encoder. The decoder does not know and does not need to know how the encoder selected those block sizes. It simply accepts the video data, reads header data to determine the encoder's block size selection, and decodes on that basis.

87. MMI is attempting to read this patent on a decoder manufacturer based on actions taken at the encoder, even though the claim recites limitations governing actions that only an encoder would perform. Indeed, the decoder manufacturer has no idea how the encoder performed those actions. In some cases, MMI itself provided those encoders. When Microsoft's decoders process bitstreams generated by another company's encoders, Microsoft's decoders are indifferent as to whether or not the encoder is practicing the Krause patent. Microsoft's decoders simply process the data, however presented.

(iii) **Dr. Drabik does not explain how H.264 meets the “selection criteria” element**

88. Dr. Drabik’s report does not explain the selection criteria used by H.264. Instead, he simply cites to an opinion from the German litigation and certain sections of the H.264 Standard. As for the German litigation, the German Court analyzed the following features, which do not appear to include a “selection criteria” element.

Decoder Apparatus

1. *for receiving the blocks of encoded video data provided by the different motion compensators of a device for the adaptive compression of digital video signals for transmission*
2. *wherein means are provided for retrieving from each received data block, a code word representative of the motion compensator, from which the block is received,*
3. *wherein means, responsive to said code word, are provided for recovering a motion vector for each block from the motion vector data received with the block, and*
4. *means, responsive to said motion vector, are provided for recovering current video image data from data provided by a current data block and at least one prior data block.*

(Krause German Opinion at 29-30 (MOTM WASH1823 0602147)).

89. Nor do any of Dr. Drabik’s citations to the H.264 Standard support his conclusion. Dr. Drabik cites the definition of “decoder” on page 7, but of course that definition does not (and would not) explain how the encoder selects block sizes. Dr. Drabik also cites § 6.4.2 on page 26, which states “Macroblocks or sub-macroblocks may be partitioned” and shows partitions, but does not explain what selection criteria is used for those partitions. Dr. Drabik cites § 8.4.1.2.3 on page 158, which explains how motion vectors are derived but not how block sizes are selected.

90. The reason that Dr. Drabik was not able to cite anything in the standard dictating a “selection criteria” is because such criteria are not specified by H.264. H.264 does not dictate how an encoder must produce bitstreams and therefore does not mandate “selection criteria.”

3.49 **encoding process:** A process, **not specified in this Recommendation | International Standard**, that produces a *bitstream* conforming to this Recommendation | International Standard.

91. It simply requires that the decoder be capable of decoding all possible block sizes, regardless of how the encoder decides to select them.

3.44 **decoding process:** The process specified in this Recommendation | International Standard that reads a *bitstream* and derives *decoded pictures* from it.

92. Dr. Drabik’s analysis of this patent is incomplete at least because he was unable to identify the “selection criteria” used by H.264.

(iv) **Element-by-element analysis of certain prior art**

93. In my opening report, I explained how several pieces of prior art disclosed adaptive block sizes. In response to Dr. Drabik’s element-by-element assertions with respect to exemplary claim 20, I now explain why certain prior art documents I cited in my opening report meet each and every element of that same claim.

(a) **U.S. Patent No. 5,144,423 (“The ‘423 patent”)**

94. The ‘423 patent (MS-MOTO_1823_00004071321) was granted on an application for patent by AT&T researchers in the United States before the invention by Krause and qualifies as prior art under at least 35 U.S.C. § 102(e).

20. Decoder apparatus comprising: means for receiving blocks of encoded video data, provided by different motion compensators depending on which motion compensator meets a selection criteria for a particular region of a video image defined by each block;

95. The '423 patent discloses a decoder apparatus with means for receiving blocks of encoded video data. For example, Column 24 includes a section describing the "HDTV Receiver's decoder." ('423 Patent at 24:25.) That section explains that "FIG. 15 presents a block diagram of an HDTV receiver that conforms to the HDTV transmitter encoder described above." ('423 Patent at 24:26-28.) Accordingly, the '423 patent discloses a decoder capable of decoding the blocks of video data encoded according to the methods of the '423 patent. I will explain how the '423 patent encodes blocks of video data in more detail below.

96. The '423 patent provides different motion compensators by applying motion vectors to different block sizes. The '423 patent provides motion vectors for either 32x16 blocks or for 8x8 blocks. Motion vectors of both types exist within the same picture. The '423 patent describes how motion vectors are generated at 7:4 – 10:26, and it explains that the encoder selects between these two types of motion compensators at 10:18 – 11:62.

97. The '423 patent selects motion compensators based on a selection criteria for particular regions of video images defined by each block. The '423 patent uses the overall criteria of "minimize the overall prediction error, within the constraints of the bit budget." ('423 Patent at Abstract.) As part of this process, the '423 patent assesses the criteria of "prediction error improvement" for each 32x16 block. For each 32x16 region, the '423 patent develops: i) eight 8x8 block motion vectors, ii) one 32x16 motion vector (encompassing the entire region), and iii) "a measure of the improvement in motion specification (i.e., a lower prediction error) that one would get by employing the eight 8x8 motion vectors in place of the 32x16 motion vector." ('423 Patent at 9:40-52.)

means coupled to said receiving means for retrieving, from each received data block, a code work [sic] representative of a motion compensator from which the block is received;

98. The decoder disclosed in the '423 patent will receive code words representative of the motion compensator for each received block. Below is an excerpt showing exemplary code words, with the highlighting added by me:

Following the 32×16 motion vectors of the slice, a bit is included to indicate whether any of the 32×16 blocks in the slice are also specified by the more refined information of the 8×8 motion vectors. If so, a code is provided that specifies which of the blocks are so more finely specified, and thereafter, up to 6 times 8, or 48, codes specify the included 8×8 motion vectors. Thus, the encoded format of the slice (with reference to FIG. 5) forms a packet as follows:

field	# of bits	description	
1	1-16	motion vector C	15
2	1-16	motion vector A-C	
3	1-16	motion vector B-C	
4	1-16	motion vector D-C	
5	1-16	motion vector E-C	
6	1-16	motion vector F-C	
7	1	subdivisions in slice	20
8	6	identify subdivisions	
9+	1-14	8×8 motion vectors	

('423 Patent at 11:3-22.) The decoder receives the motion vectors of the individual blocks from the packets of coded data. Field 7 of a packet identifies whether a block out of a group of six 32×16 blocks is further divided into 8×8 blocks. If this is the case, the bits in field 8 indicate which of the 32×16 blocks are further divided into 8×8 blocks. The motion vectors for the 8×8 blocks are contained in field 9+. As I explained above, the '423 patent discloses a decoder capable of interpreting all of these fields.

means responsive to said code word for recovering a motion vector for each block from motion vector data received with the block; and

99. The '423 patent discloses a decoder that decodes the coded data that I described above. The '423 patent explains how the motion vectors were recovered based on the code words I described above. These motion vectors are used for motion compensation. See, e.g., 24:49-25:4.

means responsive to said motion vector and common to data blocks provided by any of said different motion compensators for recovering current video image data from data provided by a current data block and at least one prior data block.

100. Figure 15 shows motion compensation block 207, into which motion vectors are transmitted. The motion compensation block 207 is common to data blocks provided by either of the motion compensators disclosed by the '423 patent. Motion compensation block 207 makes use of both a current data block and at least one prior data block. For example, the '423 patent discloses the use of a current frame and a prior frame for motion compensation. (*See, e.g.* '423 patent at 24:49-25:5.)

(b) **“Dr. Sullivan’s thesis”**

101. I have reviewed Gary Sullivan’s Ph. D. thesis. (MS-MOTO_1823_00004071449.) Dr. Sullivan completed his Ph. D. thesis in August 1991. (Sullivan Affidavit, MS-MOTO_1823_00004071629.) By August or September, he made 20-30 copies of his dissertation available to various individuals, including academics. (*Id.*) According to Dr. Sullivan’s affidavit:

6. My intention in distributing the copies was to openly share the content of my dissertation with anyone who might be interested. I was proud of the work I had done. I had no desire to keep it secret, nor did I ask anyone to keep it secret or create the impression that I intended to keep it secret. I wanted my colleagues and friends to learn more about my work, and they were free to share my dissertation with anyone they wished.

102. Accordingly, Dr. Sullivan’s thesis is prior art under 35 U.S.C. §102(a).

20. Decoder apparatus comprising: means for receiving blocks of encoded video data, provided by different motion compensators depending on which motion compensator meets a selection criteria for a particular region of a video image defined by each block;

103. Dr. Sullivan's thesis discloses a decoder apparatus. For example, pages 49-50 explain that "motion description is coded, sent to the receiver (Figure 3.2), and used by both the receiver and transmitter to construct a motion compensated prediction (MCP) frame from stored data." Figure 3.2 shows a "motion compensated video receiver" and the depicted structures include a decoder apparatus.

104. Dr. Sullivan's thesis discloses different motion compensators. His thesis discloses that a "variable block size algorithm using an optimized tree structure yields a significant improvement in rate-distortion performance over traditional motion compensation with a fixed block size." (Page 69.) He calls this algorithm V-BMA. (Page 70.) V-BMA "allows large blocks to be used when smaller blocks would provide little benefit, saving rate for other areas having more complex motion." (*Id.*) V-BMA "uses a regular decomposition of the image into blocks of varying size, with a motion vector associated with each block." (*Id.*) Thus, Dr. Sullivan's thesis discloses different motion compensators for different respective block sizes.

105. Dr. Sullivan's thesis discloses choosing motion compensators depending on a selection criteria: rate-distortion optimization. Dr. Sullivan describes rate-distortion optimization for V-BMA at pages 72-76, with simulation results following on pages 77-82.

106. Dr. Sullivan's algorithm uses selection criteria on a particular regions of images. Dr. Sullivan's algorithm uses a quadtree approach, in which regions are represented as nodes of a tree. The algorithm, generally, starts at the bottom of the tree, where the nodes represent small blocks. The algorithm considers whether the small blocks in a region should be combined into a larger block depending on whether the distortion increase of that combination would be outweighed by the bit savings. (Page 75; *see, e.g.*, equation 3.18.)

means coupled to said receiving means for retrieving, from each received data block, a code word [sic] representative of a motion compensator from which the block is received;

107. Dr. Sullivan's thesis shows that code words represent the motion compensator. After the image has been decomposed into variable block sizes, Dr. Sullivan explains that "[t]he structure of the decomposition is sent as side information along with the encoded motion vectors." (Page 70.) Dr. Sullivan's thesis also explains that motion vectors are represented by variable-length codewords such as, for example, from a Huffman code table. With respect to fixed sized BMA, Dr. Sullivan discloses that "each motion vector can be represented by a variable-length codeword (e.g., from a Huffman code table) with a known number of bits" (Page 71.) He explains that Huffman codes are also used for V-BMA. (Page 81.) In addition, Dr. Sullivan explains that codes are used to represent the quadtree structure that represents block partitions of the image. (Page 73 at Figure 3.11.) Finally, Figure 3.2 on page 50 shows "Motion Description Data" entering a Motion Compensation Predictor.

means responsive to said code word for recovering a motion vector for each block from motion vector data received with the block; and

108. As explained above, Figure 3.2 on page 50 of Dr. Sullivan's thesis shows "Motion Description Data" entering a Motion Compensation Predictor. That component, as shown in the Figure, will recover motion vectors as to form Motion Compensated Predictions. In addition, on page 52 Dr. Sullivan explains that in BMA algorithms, the "chosen MV's (one for each block) are entropy coded and sent to the receiver."

means responsive to said motion vector and common to data blocks provided by any of said different motion compensators for recovering current video image data from data provided by a current data block and at least one prior data block.

109. As explained above, Figure 3.2 on page 50 of Dr. Sullivan’s thesis shows “Motion Description Data” entering a Motion Compensation Predictor. Figure 3.2 also shows a Frame Buffer which contains image data from a prior frame and which therefore has data about the prior data block. In addition, Figure 3.2 shows a Residual Image Decoder. These components are used to recover current video image data from data provided by a current block and at least one prior data block.

(v) **The Krause patent’s “means” claim elements render those claims inapplicable to any Microsoft decoder**

110. Dr. Drabik’s opening report analyzed the only independent claim in the Krause patent that relates to a decoder: claim 20. All elements of this claim are written in “means plus function” form. I understand that claims written in “means plus function” form are limited in scope to corresponding structure disclosed in the patent’s specification and equivalents of that structure. The Krause patent does not disclose the use of software for performing the functions recited in claim 20. Microsoft’s H.264 decoders are software decoders. The hardware components disclosed in the Krause patent are not equivalent to any aspect of Microsoft’s software. Accordingly, the Krause patent does not include Microsoft’s software within its scope.

111. The Krause patent does not disclose any software. It does not identify any software components, software environments, programming languages, application programs, operating systems, or any other concepts that one typically associates with software. Rather, it implements its decoder purely in hardware, making use of components like “circuits,” “terminals,” “switches,” “latches,” and “demultiplexers.” *See, generally*, 8:52-9:17. None of these components relate to software and no other disclosure in the patent identifies any software.

112. In addition, I understand that – even if software was disclosed – the patent would need to describe an algorithm for performing the claimed functions. Having not disclosed any software at all, this patent likewise fails to disclose an algorithm for software.

113. Hardware decoders, and their attending components, are different structures from software decoders. That is why the video coding industry distinguishes between hardware decoders and software decoders. This expert report has identified at least two such examples. Microsoft’s DirectX distinguishes between hardware decoding on the one hand and software decoding on the other hand. (See http://download.microsoft.com/download/5/f/c/5fc4ec5c-bd8c-4624-8034-319c1bab7671/DXVA_H264.pdf.) Adobe Flash Player makes this distinction as well. (See http://www.adobe.com/devnet/flashplayer/articles/fplayer10_1_hardware_acceleration.html.)

114. Dr. Drabik included citations to the German Court’s ruling on this patent in his opening report. I understand that “means” elements in Germany are not interpreted as they are in the United States.

b. U.S. Patent 5,376,968: The Wu “adaptive block size” family

(i) Dr. Drabik’s interpretation of how the Wu patent applies to H.264 would mean that prior art coding standards meet all elements of the Wu claims

115. Dr. Drabik analyzed claim 19 of the Wu patent. This claim has three main requirements: a first compression mode for compressing an entire superblock, a second compression mode for compressing an entire superblock, and a third compression mode for compressing individual blocks of the superblock in different ways. Dr. Drabik’s analysis focuses on situations in which H.264 partitions a 16x16 macroblock into four 8x8 partitions. Dr. Drabik contends that the “first compression mode” is satisfied when all four 8x8 partitions split into 4x8 sub-blocks, that the “second compression mode” is satisfied when all four 8x8 partitions are split

into 8x4 sub-blocks, and that the “third compression mode” is satisfied when two of the 8x8 partitions are split into 4x8 blocks and the other two are split into 8x4 blocks. (Drabik Opening Report at ¶¶ 110-112.) Under such an interpretation of the claims, even prior video coding standards would meet all claim elements. I show this below in connection with H.261 (from the late 1980s) and MPEG-2 (from the early 1990s).

(a) **H.261**

116. The November 1988 H.261 standard. (MS-MOTO_1823_00005240294.) The November 1998 H.261 standard was published in November 1988 and is therefore prior art under at least 35 U.S.C. § 102(a) and (b). It meets all elements of claim 19.

19. Decoder apparatus comprising: means for receiving superblocks of compressed video data, said superblocks containing individual blocks each compressed using one of a plurality of compression modes;

117. As I explained in my opening report, versions of H.261 applied motion vectors on a per-macroblock basis. (My opening report at 63); (See also L. Hanzo, P. Cherriman, and J. Streit, “Video Compression and Communications”, at 240-242.) But in addition, early versions of H.261 provided motion vectors on a per-8x8 block basis. (See November 1988 H.261 standard at § 3.2.) One can group four 8x8 blocks and view them as a “superblock” because the Wu patent uses “superblock” to mean “a plurality of blocks of digital video data.” (‘968 Patent at 3:39-40.)

118. H.261 allowed encoders to choose between INTER and INTRA modes on a block-by-block basis. The encoder could select INTER mode for all four blocks in a superblock, INTRA mode for all four blocks in a superblock, or different modes for respective blocks within

the superblock. Accordingly, H.261 allowed encoders to select from a plurality of compression modes for the individual blocks within each superblock.

119. H.261 provided a decoder apparatus for receiving superblocks of compressed data. Figure 1 of the November 1988 H.261 standard shows a block diagram of a decoder apparatus.

means coupled to said receiving means for retrieving, from each received superblock, one of: first overhead data indicative of a first compression mode used to compress the whole received superblock,

120. An H.261 encoder could encode all four 8x8 blocks in INTRA mode in order to compress the whole superblock in a first compression mode. (November 1988 H.261 standard at § 3.2.) The encoder would pass overhead data in the form of “block data,” whose data structure is depicted in Figure 6. (November 1988 H.261 standard at § 4.2.3.) For INTRA mode, there would be no motion vectors. The block data would indicate this by the “Block type information (TYPE3)” data field. (See November 1988 H.261 standard at § 4.2.3.5 and 4.2.3.2.) The decoder would receive this overhead data. (November 1988 H.261 standard at Figure 1.)

second overhead data indicative of a second compression mode used to compress the whole received superblock, and

121. An H.261 encoder could encode all four 8x8 blocks in INTER mode in order to compress the whole superblock in a second compression mode. (November 1988 H.261 standard at § 3.2.) The encoder would pass overhead data in the form of “block data,” whose data structure is depicted in Figure 6. (November 1988 H.261 standard at § 4.2.3.) For INTER mode, the overhead data would include “Motion vector data.” (See November 1988 H.261 standard at § 4.2.3.5 and 4.2.3.2.)

third overhead data indicating that the individual blocks contained in the received superblock were compressed using a plurality of different compression modes;

122. An H.261 encoder could encode both of the 8x8 blocks in INTER mode and two of the 8x8 blocks in INTRA mode, resulting in individual blocks being compressed in a plurality of different compression modes. (November 1988 H.261 standard at § 3.2.) The encoder would pass overhead data in the form of “block data,” whose data structure is depicted in Figure 6. (November 1988 H.261 standard at § 4.2.3.) For INTRA mode, there would be no motion vectors, which would be indicated by the “Block type information (TYPE3)” data field. (See November 1988 H.261 standard at § 4.2.3.5 and 4.2.3.2.) For INTER mode, the overhead data would include “Motion vector data.” (See November 1988 H.261 standard at § 4.2.3.5 and 4.2.3.2.)

means responsive to said first overhead data for decoding the received superblock using a decompression mode corresponding to said first compression mode; means responsive to said second overhead data for decoding the received superblock using a decompression mode corresponding to said second compression mode; and means responsive to said third overhead data for identifying the compression mode used to compress each individual block in the received superblock and for decoding the received superblock using a decompression mode for each of said individual blocks that corresponds to the compression mode used to compress the block.

123. For all three modes, a decoder would receive the overhead data. H.261 disclosed that the overhead data was “transmitted” to a decoder.” (See November 1988 H.261 standard at § 4.2.3.5 and 4.2.3.) It explains that the “decoder will accept” motion vectors. (See November 1988 H.261 standard at § 3.2.2.) The November 1988 H.261 standard also shows the decoder at

Figure 1. The decoder would decompress the blocks in accordance with the compression mode selected by the encoder in order to render correct video output.

(b) **MPEG-2**

124. U.S. Patent 5,227,878 to Puri (“the Puri patent”) was filed November 15, 1991. (MS-MOTO_1823_00004055106.) It represents one of AT&T’s initial proposals to the MPEG-2 development effort. The Puri patent is prior art under at least 35 U.S.C. § 102(e). Moreover, the portions of Puri on which I rely were all widely known, for which the Puri patent serves as evidence. Accordingly, the disclosure that I cite is also prior art under 35 U.S.C. § 102(a). The Puri patent meets every element of claim 19.

19. Decoder apparatus comprising: means for receiving superblocks of compressed video data, said superblocks containing individual blocks each compressed using one of a plurality of compression modes;

125. The Puri patent discloses superblocks of size 16x16 that contain individual blocks of size 16x8. For example, Puri discloses that “the 16x16 luminance block is divided by a horizontal line of demarcation into a top 16x8 subblock and a bottom 16x8 subblock.” (10:60-65; 11:34-43.) The 16x16 block is a “superblock” and the 16x8 subblocks are “individual blocks.”

126. The Puri patent discloses a plurality of compression modes. Table 1 in column 28 sets forth exemplary modes.

45 picture types is listed in Table 1 below:

TABLE I				
VLC TABLES FOR MACROBLOCK TYPES				
<u>macroblock_type in I-pictures:</u>				
1	1	Intra		, frame-code
50 2	01	Intra		, field-code
<u>macroblock_type in P-pictures:</u>				
1	10	16x8	frame-MC,	frame-code
2	11	16x8	field-MC,	frame-code
3	01	16x16	frame-MC,	frame-code
4	0010	16x8	frame-MC,	field-code
55 5	0011	16x8	field-MC,	field-code
6	0001	16x16	frame-MC,	field-code
7	00001	Intra		, field-code
8	000001	Intra		, frame-code
<u>macroblock_type in B-pictures:</u>				
1	10	16x16	frame-MCbr,	field-code
60 2	11	16x16	frame-MCbr,	frame-code
3	010	16x16	frame-MCb,	frame-code
4	011	16x16	frame-MCb,	field-code
5	0010	16x16	frame-MCb,	field-code
6	0011	16x16	frame-MCb,	frame-code
7	00010	16x8	frame-MCb,	frame-code
8	00011	16x8	field-MCb,	frame-code
65 9	000010	16x8	frame-MCb,	frame-code
10	000011	16x8	field-MCb,	frame-code
11	0000010	16x8	field-MCb,	field-code
12	0000011	16x8	frame-MCb,	field-code

127. By way of example, the Puri patent discloses a first compression mode in which an entire 16x16 superblock is coded as “Intra,” a second compression mode in which an entire 16x16 superblock is coded as “Inter,” and a third compression mode in which the 16x16 superblock is divided into 16x8 blocks, each of which is individually coded.

128. Figure 2 of the Puri patent shows a decoder apparatus that includes means for receiving compressed video data.

means coupled to said receiving means for retrieving, from each received superblock, one of: first overhead data indicative of a first compression mode used to compress the whole received superblock,

129. As explained above, the Puri patent discloses a first compression mode in which an entire 16x16 superblock is coded a “Intra.” This mode is conveyed through overhead data. Column 28 of the Puri patent (including Table 1, excerpted above) shows that this mode is captured by the *macroblock__type* overhead data, for which Table 1 sets forth a VLC code table.

second overhead data indicative of a second compression mode used to compress the whole received superblock, and

130. As explained above, Puri discloses a second compression mode in which an entire 16x16 superblock is coded as “Inter.” This mode is conveyed through overhead data. Column 28 of the Puri patent (including Table 1, excerpted above) shows that this mode is captured by the *macroblock__type* overhead data, for which Table 1 sets forth a VLC code table.

third overhead data indicating that the individual blocks contained in the received superblock were compressed using a plurality of different compression modes;

131. As explained above, Puri discloses a third compression mode in which the 16x16 superblock is divided into 16x8 blocks, each of which is individually coded. (*See also* 10:60-65; 11:34-43.) This mode is conveyed through overhead data. Column 28 of the Puri patent (including Table 1, excerpted above) shows that this mode is captured by the *macroblock__type* overhead data, for which Table 1 sets forth a VLC code table.

means responsive to said first overhead data for decoding the received superblock using a decompression mode corresponding to said first compression mode; means responsive to said second overhead data for decoding the received superblock using a decompression mode corresponding to said second compression mode; and means responsive to said third overhead data for identifying the compression mode used to compress each individual block in the received superblock and for decoding the received superblock using a decompression mode for each of said individual blocks that corresponds to the compression mode used to compress the block.

132. Figure 2 of the Puri patent shows a decoder. That decoder will receive the overhead data described above in order to reconstruct video sequences. The decoder will decompress the blocks in accordance with the compression mode selected by the encoder in order to render correct video output.

133. With respect to the third mode, there exists a decompression mode for each of said individual blocks because one 16x8 block can select a motion vector (either forward or backward) and likewise the other 16x8 block can select a motion vector (either forward or backward).

(c) **Other MPEG-2 related prior art**

134. Another MPEG-2 related prior art document aligns with the Wu patent with striking similarity. Specifically, Wu disclosed selecting among compression modes based on which of the available modes required the fewest number of bits, after factoring in the necessary motion vectors and other overhead. This feature was not in the claim that Dr. Drabik analyzed, but is described in the Wu patent's Abstract and is the Wu patent's primary embodiment:

[57] **ABSTRACT**
 Digital video signals are adaptively compressed for communication to a receiver. Superblocks, each containing a plurality of blocks of digital video data, are compressed using PCM, DPCM with a general motion vector for the entire superblock, and DPCM with a specific motion vector for each block contained within a superblock. The result of each compression mode is compared after accounting for overhead data, to determine which results in the least amount of data for each block. These blocks are assembled into a superblock, and compared together with necessary overhead and motion vector data to the same superblock processed using all PCM as well as the superblock processed using all DPCM. The comparison determines which compression mode produces the least amount of data for the superblock. The most compact superblock is selected for transmission. The transmitted superblocks are decoded by a decoder that recovers the necessary motion vectors and overhead information which identifies the type of compression used to provide the superblock.

(Wu patent at Abstract.)

135. This very feature was proposed in a test model, published on October 19, 1992, for a video codec in connection with MPEG-2. The test model was published as Annex L.12 of

ISO/IEC document AVC-356 (“the test model”). (MS-MOTO 1823 00004070282 at MS-MOTO 1823 00004070465.) That document is prior art under at least 35 U.S.C. § 102(e). It discloses each and every limitation of claim 19.

19. Decoder apparatus comprising: means for receiving superblocks of compressed video data, said superblocks containing individual blocks each compressed using one of a plurality of compression modes;

136. The test model discloses a decoder apparatus. The test model explains that the proposal will require “Simple changes to the syntax of the decoder macroblock and block layers.” Moreover, the document ISO/IEC AVC-356 as a whole describes a syntax intended for a decoder to use in reconstructing video. This can be understood by the various references to “decoder” throughout the document, as well as the clear understanding of a person having ordinary skill in the field of video coding.

137. The test model describes superblocks containing individual blocks. It provides for macroblocks that correspond to the Wu patent’s “superblock.” The test model divides each superblock into four 8x8 blocks.

138. The test model provides a plurality of compression modes, which I quote below:

First mode: “Each macroblock is first compressed using intra mode for each block. The number of bits required to encode each 8x8 block (luminance and chrominance) is summed. The number of bits required to specify ‘macroblock_type’ (macroblock_intra = 1) is added to this result and the new total bit count is referred to as *N_INTRA.2*.”

Second mode: “The macroblock is again compressed, this time using inter mode for each block. The bit counts for each block is summed with the length of the motion vector codewords and the length of the ‘macroblock_type’ codeword. The resulting total bit count is referred to as

N_INTER.”

Third mode: “The macroblock is again compressed, this time using adaptive intra/inter mode. In this case, each 8x8 luminance and chrominance block is compressed in both intra and inter modes and the mode producing the least number of bits is selected. The total bit count for the macroblock is obtained by summing the bit counts corresponding to the more efficient mode for each of the 8x8 luminance and chrominance blocks. This result is then summed with the length of the motion vector codewords, the length of the ‘intra_block_pattern’ codeword (described below) and the length of the ‘macroblock_type’ codeword. The resulting total bit count is referred to as *N_ADAP.*”

means coupled to said receiving means for retrieving, from each received superblock, one of: first overhead data indicative of a first compression mode used to compress the whole received superblock,

139. The test model also discloses overhead information associated with these modes, such as macroblock_type and intra_block_pattern.

second overhead data indicative of a second compression mode used to compress the whole received superblock, and

140. The test model also discloses overhead information associated with these modes, such as macroblock_type and intra_block_pattern.

third overhead data indicating that the individual blocks contained in the received superblock were compressed using a plurality of different compression modes;

141. The test model also discloses overhead information associated with these modes, such as macroblock_type and intra_block_pattern.

means responsive to said first overhead data for decoding the received superblock using a decompression mode corresponding to said first compression mode; means responsive to said second overhead data for decoding the received superblock using a decompression mode corresponding to said second compression mode; and means responsive to said third overhead data for identifying the compression mode used to compress each individual block in the received superblock and for decoding the received superblock using a decompression mode for each of said individual blocks that corresponds to the compression mode used to compress the block.

142. The test model determines which of the three modes to use based on which generated the fewest bits:

“The mode is determined by selecting the minimum of N_INTRA, N_INTER, and N_ADAP.”

143. Moreover, as explained above, the test model was contemplated for use with a decoder. That decoder would receive the overhead data described above in order to reconstruct video sequences. The decoder would decompress the blocks in accordance with the compression mode selected by the encoder in order to render correct video output.

(ii) **Dr. Drabik does not properly analyze alternatives that were available to the JVT**

144. Dr. Drabik contends that

An alternative to the improvement of the '968 Patent at the time of adoption of the H.264 Standard was compression with fewer options for prediction. Specifically, prior art systems were known that could perform encoding either without or with motion compensation.

(Drabik Opening Report at ¶ 116.) This suggests that without MMI's patent, the JVT would have been limited to single block sizes encoded in one of two ways: intra and inter. In other words, Dr. Drabik contends that without MMI's patent, the JVT would have had to resort back to motion compensation techniques from the 1980s.

145. I explained in my opening report and showed in more detail above that prior art approaches for multiple compression modes, including the use of multiple block sizes or multiple types of motion compensation, were in the prior art and available to the JVT. Dr. Drabik does not explain how the Wu patent would provide any meaningful benefit over those alternatives, and I see no basis for concluding that it does.

146. Moreover, Dr. Drabik's analysis focuses on processing performed on H.264's 8x8 sub-partitions. As I explained in my opening report, VCEG-017 shows that removing these sub-partition modes entirely would cost about 2.5% in efficiency. (My opening report at page 210.) This caps the alleged contribution of the Wu patent. Using one of the alternatives described in my opening report and above would result in even less lost efficiency. Any benefit to the JVT would have been minimal at best.

(iii) **The Wu patent's "means" claim elements render those claims inapplicable to Microsoft's decoders**

147. Dr. Drabik's opening report analyzed the only independent claim in the Wu patent that purports to encompass a decoder: claim 19. All elements of this claim are written in "means plus function" form. I understand that claims written in "means plus function" form are limited in scope to corresponding structure disclosed in the patent's specification and equivalents of that structure.

148. The Wu patent does not disclose using software for performing the functions recited in claim 19. It does not identify any software components, software environments,

programming languages, application programs, operating systems, or any other concepts that one typically associates with software. Rather, it implements its decoder purely in hardware, making use of components like “circuits,” “terminals,” “switches,” “adders,” “latches,” and “demultiplexers.” *See, generally*, 12:14-13:11. These are all hardware components.

149. Microsoft’s H.264 decoders are software decoders. The hardware components disclosed in the Wu patent are not equivalent to any aspect of Microsoft’s software. Accordingly, the Wu patent does not include within its scope Microsoft’s software.

150. Hardware decoders, and their attending components, are different structures from software decoders. That is why the video coding industry distinguishes hardware and software decoders. This expert report has identified at least two such examples. Microsoft’s DirectX, for example, distinguishes between hardware decoding on the one hand and software decoding on the other hand. (*See* http://download.microsoft.com/download/5/f/c/5fc4ec5c-bd8c-4624-8034-319c1bab7671/DXVA_H264.pdf.) Adobe Flash Player makes this distinction as well. (*See* http://www.adobe.com/devnet/flashplayer/articles/fplayer10_1_hardware_acceleration.html.)

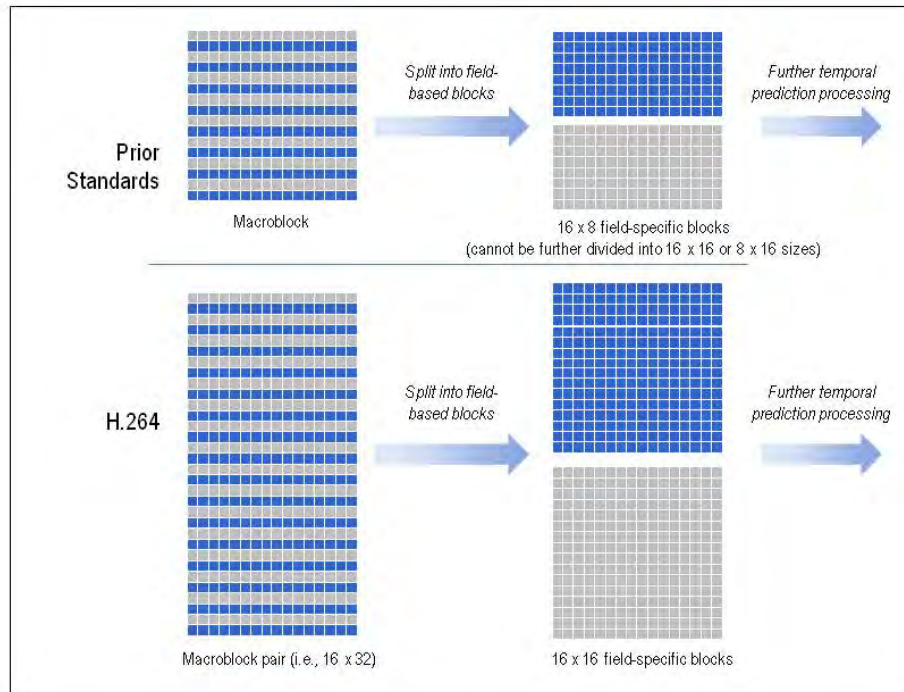
151. Dr. Drabik included citations to the German Court’s ruling on this patent in his opening report. I understand that “means” elements in Germany are not interpreted in the same way they are in the United States.

c. The Wang “MBAFF” family

(i) ‘596 patent

152. As I explained in my opening report, MBAFF is a technique specific to interlaced video content by which the lines comprising the two separate fields of a frame are deinterlaced. This allows the encoder to group lines for each field with other lines from the same field. Owing to specific aspects of how interlaced video is captured, this technique can be beneficial for parts of scenes that have motion.

153. MBAFF already existed in the prior art. MBAFF had previously been performed at the level of 16x16 groups of pixels whereas MMI proposed performing MBAFF at the level of 32x16 groups of pixels. The following figure shows the difference between the prior art MBAFF and MMI's version of MBAFF.



154. For clarity, I will use the terms "prior art MBAFF" and "MMI's version of MBAFF" in this section. Dr. Drabik did not mention prior art MBAFF in his discussion of this patent family. But Dr. Drabik knows that MBAFF was in the prior art. In fact, he stated in his report that MBAFF was in MPEG-2. (Drabik Opening Report at ¶ 27.) He also testified to this in litigation involving the '596 patent:

17 Q. And does the specification, in your
 18 mind, identify single macroblock level AFF as
 19 the prior art?
 20 A. Yes, it discusses aspects of single
 21 macroblock AFF as prior art.

(Drabik Transcript, ITC Inv. No. 337-TA-752, at 2331.) MMI's own contribution documents, which Dr. Drabik reviewed, show that MMI's inventors introduced their version of MBAFF as an alternative to the prior art MBAFF. (JVT-B106.)

155. Yet Dr. Drabik elected to ignore the prior art MBAFF in his analysis of the '596 patent. Instead, he stated that "an alternative approach to improving efficiency in interlaced video coding was to perform picture adaptive frame/field coding [PICAFF]." (Drabik Opening Report, ¶ 188.) PICAFF was not the most comparable alternative. The purpose of PICAFF is to adaptively select frame coding or field coding on a picture-by-picture basis. (March 2010 H.264 Standard, § 0.6.2.) The purpose of MBAFF – both the prior art version and MMI's version – is to adaptively select frame mode or field mode on a "more localized basis." (March 2010 H.264 Standard, § 0.6.2.) Dr. Drabik's claim that PICAFF was the relevant alternative to MMI's MBAFF is simply wrong.

156. After incorrectly identifying PICAFF as the relevant alternative, Dr. Drabik contended that "MBAFF was demonstrated to perform as much as 16% better than picture level adaptive frame/field coding (PAFF)." (Drabik Opening at ¶ 188.)⁶¹ As I explained in my








⁶¹ The very paper that Dr. Drabik cited for this performance comparison described the prior art MBAFF, yet Dr. Drabik still elected not to mention the prior art MBAFF as an alternative to Motorola's MBAFF. *See* Wiegand at MOTM_WASH1823_0336713 ("Note that, unlike in MPEG-2, the frame/field decision is made at the macroblock pair level rather than within the macroblock level.")

opening report, assessing the importance of MMI's MBAFF requires a comparison with the prior art version of MBAFF, which was readily available to the JVT. Although the data was limited, I found two seemingly comparable tests, one of which shows the prior art MBAFF achieving about a 9.8% bitrate savings over PICAFF and another of which shows the MMI version of MBAFF achieving only a 6% bitrate savings. (*See* my opening report at 176-177.) This supports my opinion that MMI's version of MBAFF provides little, if any, of H.264's coding gain. Dr. Drabik's claim of 16% gain should be rejected.

157. Dr. Drabik also analyzed dependent claim 2 from the '596 patent, likely because the International Trade Commission found claim 1 invalid. Moreover, the claim construction for the term "macroblock" that the ITC used to invalidate that claim was also adopted by the Court for the present litigation. (*See* Case 2:10-cv-01823-JLR, Doc. No. 258.) Dependent claim 2 covers the same method as claim 1, but with the further limitation that the frame or field macroblocks resulting from the adaptive selection are divided into block sizes of 16x16, 16x8, 8x16, 8x8, 8x4, 4x8, or 4x4. MMI did not invent or contribute these block sizes to H.264. These block sizes were contributed before MMI joined JVT. The contribution documents that resulted in these block sizes were submitted between December 1997 and August 1998, making them prior art to this patent. Document Q15-H-10, submitted by Telenor for the August 1999 VCEG meeting, included all of the sizes listed by claim 2:

1 Use of 7 different blocksizes in motion compensated prediction

So far 3 block sizes have been used for motion compensation: 16x16, 8x8 and 4x4 vectors. We have added 4 more vector sizes as indicated below.

Mode: 1	2	3	4	5	6	7
						

(Q-15-H-10) (note: pictures were not aligned with corresponding numbers in original document.)
MMI should not be credited with any improvement arising from the use of the block sizes listed in claim 2.

158. Moreover, the prior art included the combination of MBAFF with 5 of these 7 modes. The only addition made by the MMI patents relates to MBAFF with the 16x16 and the 8x16 modes.

159. Finally, Dr. Drabik has not indicated why the combination of MBAFF with these the particular block size modes would provide any notable coding gain.

(ii) **All other patents in this family**

160. Every patent in this family is directed to the same feature: MMI's version of MBAFF. Dr. Drabik separately analyzed all eight patents in this family but these patents do not represent eight different technical contributions. The '596 patent, discussed above, includes independent claims directed to MMI's version of MBAFF. MMI then filed 7 other patents directed to this same MBAFF feature, tacking on other limitations describing H.264 features that MMI neither invented nor contributed. These 7 other patents were all filed as divisional applications stemming from the '596 patent and all claim priority to the same provisional application to which the '596 patent claims priority. This patent filing practice inflated MMI's number of allegedly essential patents but adds nothing to the value of MMI's portfolio. A patent-by-patent analysis follows.

161. U.S. Patent No. 7,310,374: According to Dr. Drabik, this patent claims MMI's version of MBAFF in combination with inter-coding. (Drabik Opening Report at ¶ 192.) MMI did not invent inter-coding, which was used in video coding standards as far back as MPEG-1. I summarized MPEG-1's inter coding techniques in my opening report at pages 51-53. *See also* Symes, Digital Video Compression, at page 156. The specific inter-coding techniques disclosed

and claimed in this patent were the contributions of others. MMI can claim no additional coding gain for inter-coding. In addition, Dr. Drabik has not explained why the two additional block sizes made available by MMI's MBAFF with inter-coding would provide any greater benefit than the sum of the gains provided by these features in isolation.

162. U.S. Patent No. 7,310,375: This patent claims MMI's version of MBAFF in combination with intra-coding. (Drabik Opening Report at ¶ 195.) MMI did not invent intra-coding, a concept that has existed as far back as MPEG-1's intra-coded "I-frames." (See my opening report at pages 51-53.) H.264's specific intra-coding techniques were likewise not invented or contributed by MMI. Rather, they came about through contributions from companies such as Telenor and RealNetworks. (See my opening report at pages 112-113.) For example, VCEG-N54 was submitted by RealNetworks in September 2001 (prior to this patent family's priority documents) and it includes the figure by which MMI's patents explain intra-coding (albeit with a different mode numbering convention).

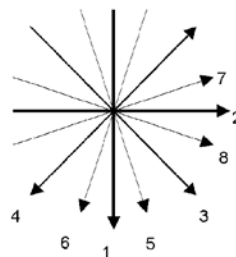
2 The Experiment

The proposed scheme uses predictor and predicted pixels as shown in Fig. 1. The prediction modes include a DC mode (unchanged from TML8) and 8 directional modes shown in Fig. 2. The three new directions added are those of modes 4, 5 and 8. Directions 6 and 7 are calculated using more prediction pixels.

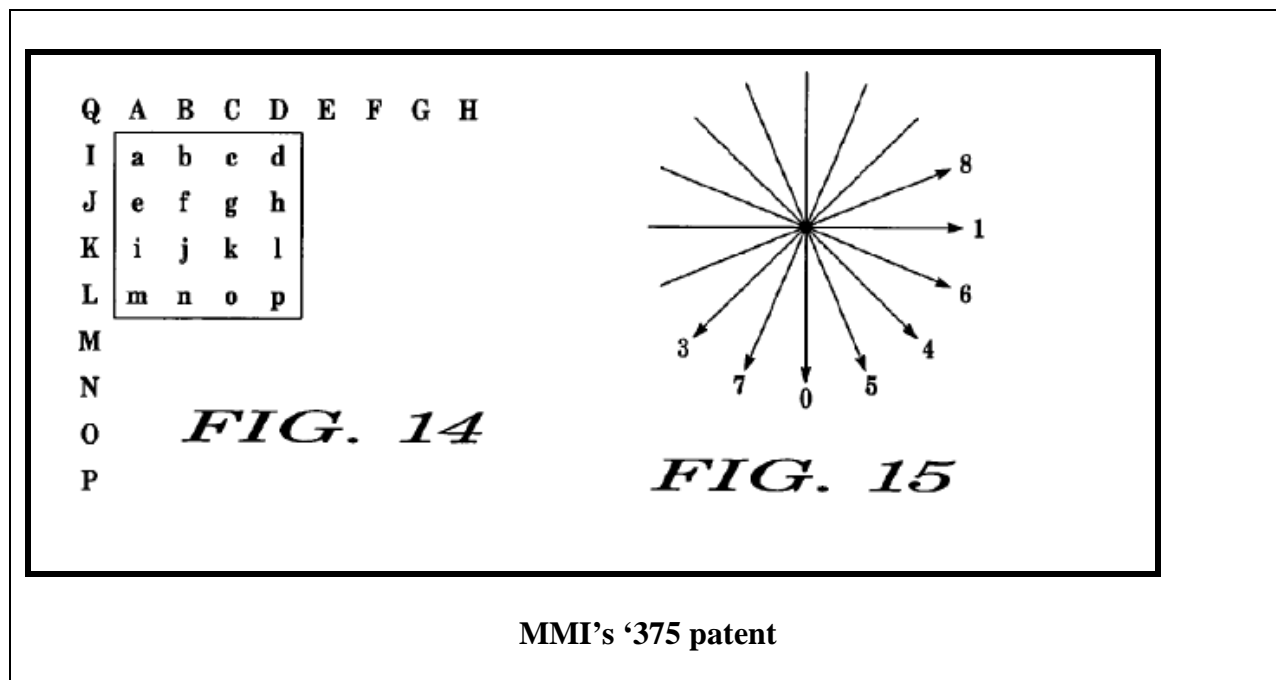
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X A B C D E F G H
I a b c d
J e f g h
K i j k l
L m n o p
M
N

```



VCEG-N54 (submitted by RealNetworks in September 2001)



163. MMI can claim no additional coding gain for this patent's technology beyond what the '596 patent provides. In addition, Dr. Drabik has not explained why the two additional block sizes made available by MMI's MBAFF with intra-coding would provide any greater coding gain than the sum of the gain from these features in isolation.

164. U.S. Patent No. 7,310,376: According to Dr. Drabik, this patent claims MMI's version of MBAFF with the use of a horizontal or vertical scanning path when sequencing macroblock pairs for processing. (Drabik Opening Report at ¶ 192.) The patent describes proceeding through the macroblock pairs either horizontally (*i.e.*, left-to- top-to-bottom) or vertically (*i.e.*, top to bottom, left-to-right). MMI did not invent scanning macroblocks either horizontally or vertically. Logic, of course, dictates that prior coding standard had to scan macroblocks in some order as well, and horizontal or vertical were logical choices. MPEG-1, for example, used a horizontal scan order. (*See, e.g.*, Symes, Digital Video Compression, at 155.) The specific scanning patterns disclosed and claimed in this patent were not the contributions of

MMI. MMI can claim no additional coding gain for this patent's technology beyond what the '596 patent provides. In addition, Dr. Drabik has not explained why the two additional block sizes made available by MMI's MBAFF combined with horizontal or vertical scanning provide any greater coding gain than the sum of gain from these features in isolation.

165. U.S. Patent No. 7,310,377: This patent claims the combination of MBAFF with frames in which some portions are inter-coded and some portions are intra-coded. MMI did not invent the idea of pictures in which some portions are inter-coded and other portions are intra-coded. For example, MPEG-2 provided for P-pictures, which are generally inter-coded. MPEG-2 allowed the P-pictures to include intra-coded macroblocks:

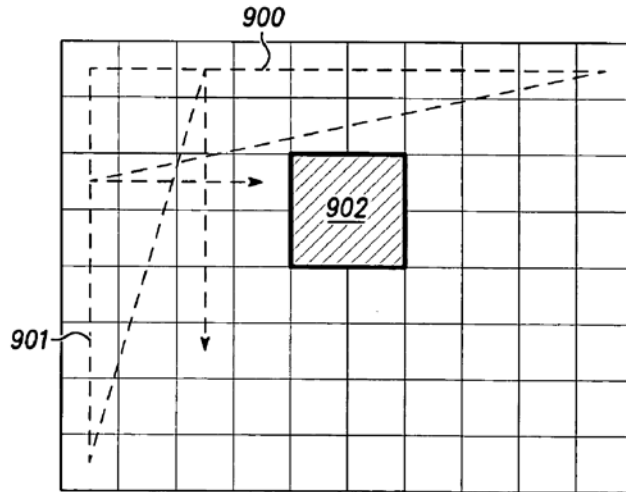
• VLC Table for macroblock_type modes in P-pictures

macroblock_type	macroblock_quant	macroblock_motion_forward	macroblock_motion_backward	macroblock_pattern	macroblock_intra	VLC
MC, Coded		1		1		1
No MC, Coded				1		01
MC, Not Coded		1				001
Intra					1	00011
MC, Coded+macroblock_quant	1	1		1		00010
No MC, Coded+macroblock_quant	1			1		00001
Intra+macroblock_quant	1				1	000001

(See Haskell *et. al*, Digital Video: An Introduction to MPEG-2, at p. 166.) And the specific inter- and intra-coding techniques disclosed and claimed in this patent were the contributions of others. MMI can claim no additional coding gain for this patent's technology beyond what the '596 patent provides. In addition, Dr. Drabik has not explained why the two additional block sizes made available by MMI's MBAFF with frames having inter-coded and intra-coded portions would provide any greater coding gain than the sum of the gain from these features in isolation.

166. U.S. Patent No. 7,421,025: According to Dr. Drabik, this patent claims MMI's version of MBAFF in which the adaptive frame/field coding can be performed on any multiple

of two macroblocks, rather than a pair of macroblocks. (Drabik Opening Report at ¶ 208.) For example, Figure 10 of this patent shows the use of four macroblocks.



200 **FIG. 10**

167. But H.264 performs MBAFF on pairs, not on any other sizes. This patent relates to H.264 in only one situation: when the “multiple” is 1. That amounts to the same situation claimed by the ‘596 patent. This patent adds nothing of value to H.264 other than what the ‘596 patent already provides and MMI can claim no additional coding gain.

168. U.S. Patent No. 7,477,690: This patent claims the combination of MBAFF with skipped macroblocks. MMI did not invent or contribute skipped macroblocks. For example, MPEG-2 implemented skipped macroblocks:

In P-pictures, **skipped MBs** are assumed NonIntra with zero DCT coefficients and zero motion vectors. In B-pictures, **skipped MBs** are assumed NonIntra with zero DCT coefficients and motion vectors the same as the previous MB, which cannot be Intra.

(*See Haskell et al.*, Digital Video: An Introduction to MPEG-2, at MS-MOTO_752_0000977620.) Moreover, the specific techniques for skipped macroblocks for H.264 were the contributions of others, not MMI. MMI can claim no additional coding gain for this patent's technology beyond what the '596 patent provides. In addition, Dr. Drabik has not explained why the two additional block sizes made available by MMI's MBAFF with skipped macroblocks would provide any greater coding gain than the sum of the gain from these features in isolation.

169. U.S. Patent No. 7,817,718: This patent claims the combination of MMI's version of MBAFF with the use of two motion vectors for blocks in bi-predicted pictures. MMI did not invent bi-predicted pictures. (Drabik Opening Report at ¶ 217.) As I explained in my opening report, even MPEG-1 had B-frames, for which two motion vectors could be used. MPEG-2 provided this same functionality as well, and even extended the concept to field prediction. (*See Haskell et al.*, Digital Video: An Introduction to MPEG-2, at MS-MOTO_752_0000977605 – 06.) And the specific techniques for the use of two motion vectors disclosed and claimed in this patent were the contributions of others, not MMI. MMI can claim no additional coding gain for this patent's technology beyond what the '596 patent provides. In addition, Dr. Drabik has not explained why the two additional block sizes made available by MMI's MBAFF with the use of two motion vectors for bi-predicted pictures would provide any greater coding gain than the sum of the gain from these features in isolation.

170. Application No. 12/907,656: This application claims the combination of MMI's version of MBAFF with the use of two motion vectors for blocks in bi-predicted pictures. That is substantively the same as the '718 patent, discussed above. Accordingly, MMI can claim no

additional coding gain for this patent's technology. In any event, this application has not issued as an enforceable patent.

(iii) **Summary**

171. This family includes nearly half of the seventeen MMI patents at issue. Claim 1 of the '596 patent, directed to MMI's version of MBAFF, was found invalid during an International Trade Commission proceeding. Claim 2 of the '596 patent and all the features that Dr. Drabik identified for the other patents in this family claim MMI's version of MBAFF in combination with features that were known in the prior art. MMI's patent filing practice artificially inflated the number of patents that MMI can claim are essential. Indeed, each of these patents has the same disclosure in the specification. MMI continues this patent filing practice to the present day: Dr. Drabik contends that Application No. 12/907,656 is "a key contribution to the H.264 standard" even though Dr. Drabik acknowledges that this application covers the exact same feature as an already-existing MMI patent.

Dr. Drabik's description of the '718 patent:	Dr. Drabik's description of Application 12/907,656:
"...directed to the MBAFF technique discussed in connection with a plurality of smaller portions (<i>e.g.</i> , macroblock pairs), where at least two motion vectors are derived for at least one block in a bi-predicted picture."	"directed to the MBAFF technique discussed in connection with a plurality of smaller portions (<i>e.g.</i> , macroblock pairs), where at least two motion vectors are derived for at least one block in a bi-predicted picture."
(Drabik Opening Report at ¶ 221.)	(Drabik Opening Report at ¶ 217.)

172. The total technological value of the eight patents in this family consists entirely of MMI's version of MBAFF. That value can be no more than the coding gain that MMI's version of MBAFF compared with the prior art version of MBAFF. Dr. Drabik did not investigate how much benefit MMI's version provided, but I did. The data I reviewed suggests that the gain was

minimal. (See my opening report at pages 176-177.) Moreover, the gain exists only for interlaced content where the 16x16 and 8x16 block sizes are used.⁶² In all other situations, including for progressive video, this patent family provides no value at all.

d. The Wang “PICAFF” family

(i) Neither PICAFF nor the features that each patent combined with PICAFF were contributed by MMI

173. All patents in this family combine PICAFF, which was in the prior art, with various other H.264 features to which MMI did not contribute. Indeed, the named inventors have admitted that PICAFF and these additional features, at least in isolation, were in the prior art. I explained in my opening report that prior art MPEG-2 provided PICAFF. (See my opening report at p. 179.) In a deposition for ITC Investigation No. 337-TA-752, inventor Krit Panusopone said the same thing:

25	Q	Are there any other types of AFF that you're
1		aware of?
2	A	I also think that MPEG-2 has the picture level
3		adaptive of AFF.

174. 7,769,087: Dr. Drabik characterizes this patent as PICAFF in combination with “the picture [having] two motion vectors, which can both point in the forward or backward direction.” (Drabik Opening Report at ¶230.) Months before any of this patent’s priority

⁶² Dr. Drabik appears to have made a mistake in paragraph 189 of his report. He states that the 4x8 block size would not be available for macroblocks in field mode under the prior art version of MBAFF. (Drabik Opening Report at ¶189.) That block size was available in the prior art version of MBAFF. See, e.g. VCEG-N85 at Figure 2 (Field mode 5a).

documents were filed, and before MMI was part of JVT, named inventor Limin Wang went to a VCEG meeting. There, he learned that VCEG had introduced this feature into H.26L. He wrote a memo about the meeting, including this feature, and sent it to three other named inventors of the '087 patent:

6. B frame will be included in H.26L. It will be implemented in TML6. The interesting point was that the concept of *B* frame had been generalized. That is, the second reference frame may not necessarily a future frame. Both reference frames can be the previous coded frames.

7. VLC is a big issue. The current UVLC seems not very optimized. There are a few proposals on

(MOTM WASH1823_0603551.) Clearly, MMI did not invent or contribute the feature that this patent added to PICAFF. MMI can claim credit for neither PICAFF's coding gain nor the coding gain of multiple motion vectors both pointing in the same direction. In addition, Dr. Drabik has not explained why this combination provides any benefit greater than the sum of the independent benefits of each feature in isolation.

175. 7,660,353: Dr. Drabik characterized this patent as PICAFF in combination with bi-predicted pictures having two motion vectors, with the second motion vectors being encoded as an offset of the first. (Drabik Opening Report at ¶ 239.) As I explained in my opening report, MMI acknowledged that this feature was already in the draft standard. (JVT-D090.) Accordingly, it was not MMI's contribution. MMI can claim credit for neither PICAFF's coding gain nor the coding gain of providing two motion vectors with one being encoded as an offset of the first. In addition, Dr. Drabik has not explained why this combination provides any benefit greater than the sum of the independent benefits of each feature in isolation.

176. 7,839,931: Dr. Drabik characterized this patent as PICAFF in combination with reference pictures that are indexed. (Drabik Opening Report at ¶ 248.) As I explained in my opening report, MMI's contribution document JVT-D043 acknowledged that indexing reference pictures was already in the draft standard. As such, it was not MMI's contribution. MMI can

claim credit for neither PICAFF's coding gain nor the coding gain of providing indexed reference pictures. In addition, Dr. Drabik has not explained why this combination provides any benefit greater than the sum of the independent benefits of each feature in isolation.

(ii) **Dr. Drabik incorrectly gives MMI credit for providing PICAFF's coding gain**

177. Dr. Drabik attempts to give MMI's patents credit for all of PICAFF's coding gain. In paragraphs 236, 245, and 254 of his report, Dr. Drabik contends that the relevant alternative to these patents would be to abandon PICAFF entirely and "code the bi-predicted pictures all in frame mode or all in field mode." He then states that PICAFF provided "16% to 20%" gain over frame-only coding.

178. PICAFF was in the prior art. JVT members were free to use it without license to MMI's patents because MMI has no claims covering PICAFF by itself. Dr. Drabik is wrong to suggest that the JVT would have had to give up the entire coding gain provided by PICAFF without MMI's patents.

179. In my opening report, I identified several more appropriate alternatives, including the use of prior art PICAFF in combination with prior art MPEG-2 techniques for coding bi-predicted frames. In addition, I explained that removing PICAFF entirely would have been an alternative because the JVT could have used the prior art version of MBAFF instead. Prior art MBAFF generally provides similar bitrates or in many cases a bitrate savings as compared to PICAFF, as shown by the tests in VCEG-037. *See, e.g.* VCEG-037 at pp. 12-16. The JVT could have adopted any of these approaches. Finally, Dr. Drabik does not mention that for progressive video, the gain is indisputably 0% because PICAFF and the features that MMI claims infringe these patents are not used.

e. **The Wang "alternate scan" family**

180. Dr. Drabik contends that MMI's alternate 4x4 scan and 8x8 scan represented a "key contribution" to the H.264 Standard because they offered "significantly more compression than traditional zig-zag scanning paths in *many applications, including* interlaced video coding." (Drabik Opening Report at ¶ 161, 167) (emphasis added). As an initial matter, Dr. Drabik has not identified any other applications aside from interlaced video coding where the alternate scans would be useful. The H.264 Standard uses alternate scans for field coding, which is specific to interlaced video. (March 2010 H.264 Standard at § 8.5.6.) Alternate scans are not used for progressive video, which are frame coded. (March 2010 H.264 Standard at § 0.6.2.)

181. Even putting that significant fact aside, Dr. Drabik mischaracterizes the options that were available to the JVT aside from MMI's alternate scan. The JVT was not faced with a choice between MMI's alternate scan and the traditional zig-zag scan. The JVT happened to adopt MMI's scan, but other alternate scans existed and had been suggested to the JVT. MMI's patents cannot be credited with all gains coming from alternate scans as compared to zig-zag scans. I discuss this below for each of MMI's alternate scans.

(i) **'094 patent: 4x4 alternate scan**

182. Even putting that aside, Dr. Drabik's claimed gain of "up to 7%" misreports the results of the relevant documents. The document on which he relies, JVT-C140, does not test MMI's alternate scan applied to the H.264 algorithm. JVT-C140 proposes a modification to an unrelated proposal called "Adaptive Block Transform" (ABT), and it reports results from tests designed to compare ABT as originally proposed with ABT using a collection of 4 different alternate scans for block sizes 4x4, 4x8, 8x4, and 8x8. Half of the alternate scans used in these tests (the 4x8 and 8x4 scans) are also unrelated to anything found in H.264. Thus, the JVT-C140 document tests a combination of alternate scans unrelated to H.264, and compares the performance of those scans to another algorithm (ABT) unrelated to H.264. The ABT proposal

was rejected by the JVT, and the results of these tests, which Drabik exaggerates as 7% gain, are clearly unrelated to H.264.

183. When MMI realized that ABT would not be approved as part of H.264, it conducted tests of its alternate 4x4 scan in H.264, and offered test results in JVT-E108. That document shows an average bitrate savings of 2% as compared to zig-zag:

Table 3. Bit Rate savings (%) by using scan method 2 over scan method 1 for IP only						
Sequence	Canoa	F1 car	Rugby	Bus	Mobile	Tempete
BDBR(%)	3.70	1.86	3.46	2.89	0.67	-0.54

184. And Sony also tested MMI's 4x4 scan in JVT-E118 to find a bitrate savings of just 1% over zig-zag:

	BD-PSNR [dB]	BD-Bitrate [%]
Canoa	0.156	-3.00
Bus	0.084	-1.78
Tempete	-0.052	1.53

185. Drabik misrepresents the Sony scan as one "... that was proposed with Motorola's '094 Patent proposal pattern." (Drabik Opening Report at ¶ 160). In fact, the Sony scan was for a different scan path and was proposed **before** any Motorola scan was disclosed. The evaluation of the Sony scan cited by Drabik (JVT-B001d2) in his Opening Report was conducted in January, 2002, over 3 months prior to the proposal of the Motorola scan for ABT. It should also be noted that the assessment cited by Drabik that the Sony scan "Need(s) to demonstrate larger gain for acceptance" was made by the Ad Hoc Group (AHG) on Interlaced Coding of the JVT, an AHG co-chaired by one of the named inventors of Motorola's '094 patent. (See JVT-B001d2, p. 31).

186. Dr. Drabik also misrepresents the quality of the Sony alternate scan in ¶ 160 of his Opening Report. Though Drabik quotes the conclusion of the AHG from JVT-B001d2, he

omits the quantitative results upon which the AHG based its conclusion, listed on the line immediately preceeding the one he cites:

All – 1.7%, IP 1.8%, IBBP 1.3% (Tempete). Small coding gain. IP considerations not known.

187. By comparing these notes directly with the Sony proposal (JVT-B068), it is clear that the AHG based its negative assessment of the Sony scan on the fact that, for the Tempete video sequence, the Sony scan showed negative savings (i.e. an increase) of 1.76% bitrate when applied to all I-pictures, a savings of only 1.86% bitrate when applied to IP pictures, and a savings of only 1.28% bitrate when applied to IBBP pictures. These exact percentages come directly from the JVT-B068 document. Though these results may have concerned the AHG at the time, direct comparisons with multiple tests of the Motorola scan in JVT-E108 and JVT-E118 show that the Motorola scan even poorer on the same sequence under the same conditions. From Motorola's tests of its own scan for the Tempete video sequence applied to IP pictures (JVT-E108, Table 3), the Motorola scan shows a negative savings (i.e., an increase) of .54% bitrate. The equivalent Sony tests of the Motorola scan in JVT-E118 also show a bitrate increase of 1.54% on the same Tempete video sequence. Both these negative bitrate savings for the Motorola scan on the Tempete video sequence demonstrate that the Sony scan, which showed a positive 1.86% bitrate savings on the same sequence, outperforms the Motorola scan.

(ii) **'888 patent: 8x8 alternate scan**

188. I explained in my opening report that MPEG-2 used a similar alternate scan for 8x8 blocks. (My opening report at page 162.) Researchers from Sony suggested to the JVT that H.264 could use this scan as well. MMI's inventors knew about MPEG-2. For example, named inventor Ajay Luthra testified about MPEG-2's alternate scan during a deposition for ITC Inv. No. 337-TA-752:

13:12:50 22	MR. MUKHERJEE: Q. And why did the MPEG-2
13:12:53 23	standard use that alternative scan?
13:12:58 24	A. It was shown at that time it improved the
13:13:04 25	coding efficiency for interlaced video.

(Luthra Deposition, ITC Inv. No. 337-TA-752, at 105.) Yet Dr. Drabik's expert report identified the traditional zig-zag scan as the relevant alternative, contending that MMI's scan provided up to a 7% gain. (Drabik Opening Report at ¶ 166.) There are several problems with Dr. Drabik's analysis.

189. First, the value of MMI's scan should be considered in comparison to the most relevant alternative that was available to the JVT, which was MPEG-2's alternate scan. It is clear that MPEG-2's alternate scan would present a closer alternative than the traditional zig-zag scan. For example, JVT-B068 tested MPEG-2's alternate scan as compared to the zig-zag scan and found that it provided 2.39% gain on average. A comparison between MMI's alternate scan and the traditional zig-zag scan would therefore overstate MMI's performance as compared to the most relevant alternative.

190. Even putting that aside, Dr. Drabik's assertion of a gain "up to 7%" is misleading. The document on which he relies, JVT-C140, shows that a 7% gain over zig-zag was achieved for just one out of six test sequences. Other results in that document showed lower gains, with one result showing a gain of about 3%. In addition, JVT-C140 provides a single set of test results for scans of various block sizes, including 4x8 and 8x4 scans that are not part of H.264. This means one cannot separate out which portion of the "up to 7%" gain came from MMI's 8x8 alternate scan as compared to scans for the other block sizes.

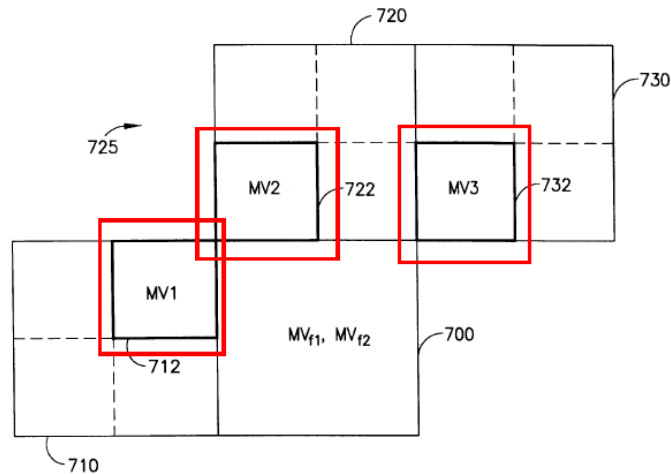
(iii) **Conclusion**

191. Dr. Drabik attributed an "up to 7% gain" for MMI's alternate scan patents by comparing them to the zig-zag scan even though other alternate scans were indisputably

alternatives from the prior art and available to the JVT. The available test results suggest that the gains from MMI's scans are negligible and may even be negative. Moreover, the document Dr. Drabik relied on to conclude a "7% gain" actually shows other test results with lower gains, and does not even separate out the gain from MMI's 4x4 and 8x8 alternate scans from the gain provided by other scans. I found test results focused on MMI's 4x4 scan and they show far lower gains. Finally, for progressive video, alternate scans are not used and provide no gain at all.

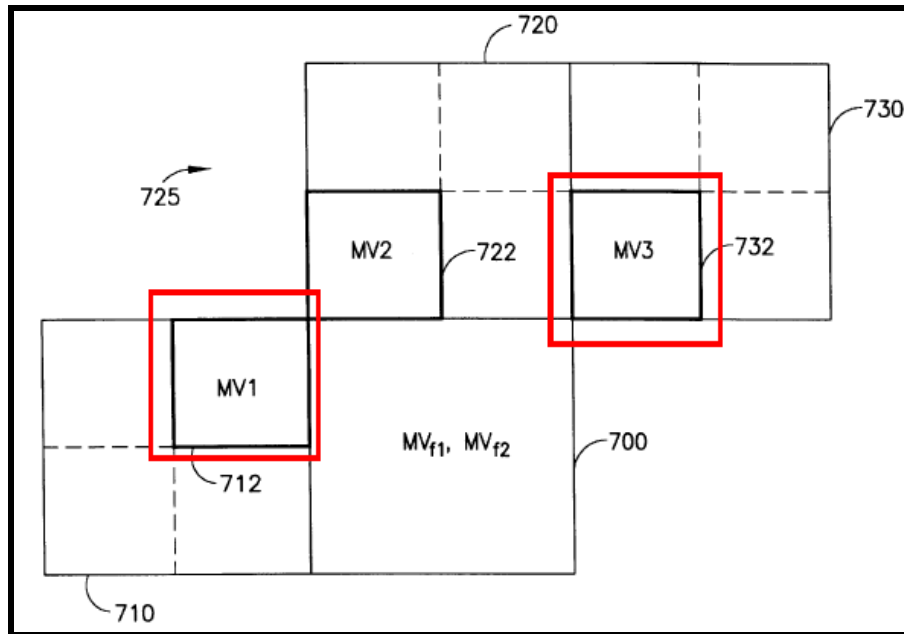
f. **U.S. Patent 6,005,980: The Eifrig "neighboring motion vector" family**

192. Dr. Drabik contents that "[a]n alternative at the time of the adoption of the H.264 Standard was to use only one neighboring block to derive a prediction motion vector for a current block in situations where one of the current block or three neighboring blocks was field-coded" but that "only one neighboring block provided worse results than a prediction motion vector derived from the motion vectors of three neighboring blocks." (Drabik Opening at ¶ 131.) This underscores the implausible nature by which Dr. Drabik chose alternative implementations that the JVT could have selected. MMI's claims are very precise in scope about the three neighbors that must be used: the claims require one neighbor immediately to the current block's left, one neighbor immediately above the current block, and one neighbor immediately to the current block's top-right. The neighbors required by the claims are boxed in red below:

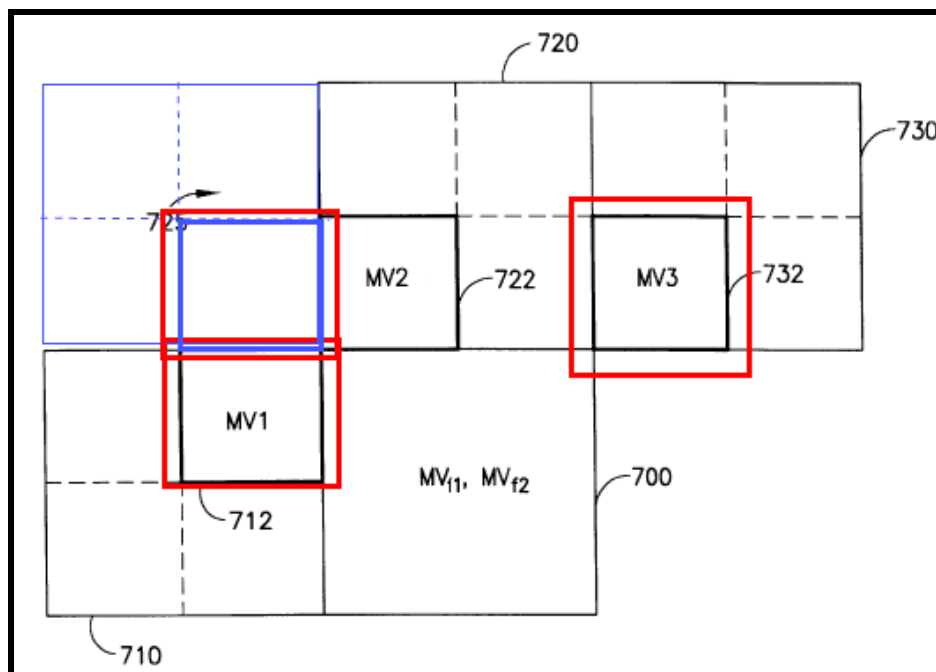


193. Dr. Drabik identified the relevant alternative as the use of one motion neighbor, which he contends would offer worse performance than the use of three neighbors. Dr. Drabik does not offer any numerical evidence supporting this assertion, and the overall performance gain coming from the use of three neighbors is likely to be incremental in the context of H.264 as a whole.

194. Moreover, by Dr. Drabik's logic, the use of two neighbors would be better than just one, resulting in a non-infringing alternative that the JVT could have adopted with lower performance loss than Dr. Drabik's purported alternative. By way of example, one could simply use the neighbors identified in red below:



195. Similarly, the JVT could have selected an alternative set of three neighbors. MMI selected the three neighbors claimed in its patent by copying them from prior art H.263. (*See* my opening report at page 156.) But motion vector prediction is useful because motion vectors for nearby blocks are correlated and that correlation is not limited to just the three neighbors claimed in MMI's patent. An alternative approach might include swapping one of the neighboring blocks with a different block (so long as the block has already been coded and belongs to the same slice). Such a switch likely would not introduce a significant performance impact. For example, the figure below shows an alternative block in blue:



196. Moreover, Dr. Drabik's analysis ignores the relevant prior art. As I explained in my opening report, MMI's patent claims copy (exactly) an implementation for median motion vector prediction described in H.263 documents. To this, MMI's claims add one element about interlaced coding. One can achieve the same net effect of MMI's patent claim by passing each field of a frame separately into the H.263 encoder as a separate picture. (Orchard Opening at 158-159.)

197. In sum, Dr. Drabik's proposed alternative – to abandon the use of multiple neighbors entirely – is unduly restrictive. The JVT could have avoided the use of MMI's patent by simply choosing a different number or different set of nearby blocks. Moreover, anyone could have achieved the same net effect of MMI's patent by passing fields of a frame into the prior art H.263 codec. Dr. Drabik did not offer any evidence of the benefit provided by MMI's patent, but the discussion above shows that the benefit was minimal at best. Moreover, for progressive video, MMI's patent does not apply and therefore does not provide any benefit.

198. Finally, I note that MMI is a member of the MPEG-4 Visual Pool, which includes this patent. The MPEG-4 Visual pool offers this patent at rates similar to the MPEG-LA pool for H.264.

g. U.S. Patent 6,836,514: The Gandhi “error resilience” patent

199. As an initial matter, I understand that MMI no longer contents that this patent is essential to any part of H.264. MMI’s response to Interrogatory No. 17 (which was Ex. E to my opening report) does not identify this patent. As I will show below, I agree that this patent is not essential to any aspect of H.264.

(i) Dr. Drabik does not show that the Gandhi patent is essential to H.264 and I do not believe that it is essential

200. Dr. Drabik’s analysis for the Gandhi patent is both incomplete and flawed. Dr. Drabik analyzed claim 69, but this claim does not cover any aspect of H.264. I explain this below on an element-by-element basis.

69. A device operable for the detection and mitigation of errors occurring within a bitstream of a digital video input, wherein the device comprises: an error detector element, coupled to the received digital input, operable to utilize information in a received bitstream for determining when one or more errors are present in one or more frame overhead fields of the received bitstream;

201. For this claim element, Dr. Drabik cites pages 305-306 of the H.264 Standard, pointing specifically to Annex B.3. Annex B.3 states:

When an error in the bitstream syntax is detected (e.g. a non-zero value of the forbidden_zero_bit or one of the three-byte or four-byte sequences that are prohibited in subclause 7.4.1), the decoder may consider the detected condition as an indication that byte alignment may have been lost and may discard all bitstream

data until the detection of byte alignment at a later position in the bitstream as described in this subclause.

This passage identifies only two possibilities for the claimed “frame overhead fields”: the “forbidden_zero_bit” and the “the three-byte or four-byte sequences that are prohibited in subclause 7.4.1.” Neither can satisfy this claim.

202. The “forbidden_zero_bit” cannot meet this claim because it is found in the Network Abstraction Layer (NAL) Unit. That is a different part of the H.264 syntax hierarchy from frames and thus does not satisfy the “frame overhead fields” limitation. The prohibited “the three-byte or four-byte sequences” are not “frame overhead fields” either. In fact, they are not fields at all. They are multi-byte sequences that are prohibited in the H.264 syntax. If one of the prohibited sequences appears in the bitstream, an error would have necessarily occurred. The prohibited sequence might appear in bits belonging to one field or it might appear in bits that overlap among two fields. Even if the error appears in one field, there is no reason to believe that it would exist within a frame header field as opposed to any of the other fields in the H.264 syntax. Because the prohibited byte sequences can appear anywhere in the bitstream, irrespective of the location of frame headers, these prohibited byte sequences cannot satisfy the element of “frame overhead fields.”

and an error mitigation element, coupled to the error detector element, operable, in response to the error detector finding the one or more errors in one or more frame overhead fields, operable to replace corrupted information in the received bitstream with improved information in accordance with one or more formulae.

203. The “forbidden_zero_bit” and the prohibited byte sequences do not meet this limitation either. This claim element requires that “an error mitigating element ... replace

corrupted information in the received bitstream with improved information in accordance with one or more formulae.” (Emphasis added.) H.264 does not require, or even suggest, that corrupted information be replaced with improved information. In fact, Annex B (which Dr. Drabik relies on for the previous element) calls for discarding bitstream data upon detection of an error, not replacing data. (H.264 Standard at page 306.)

204. In addition, the concept of replacing corrupted information with improved information does not make sense for either the “forbidden_zero_bit” or the prohibited byte sequences. For the “forbidden_zero_bit,” the only possible error would be if this bit was equal to a 1. While it would be simple to replace this corrupted information with improved information (namely, a 0), that replacement is not suggested in H.264. There would be no value in making such a replacement. Nor can one replace the prohibited byte sequences with improved information. As I explained above, the prohibited byte sequences could potentially appear anywhere in a bitstream. There is no way to know ahead of time what type of data should have appeared at the location of a prohibited byte sequence. As such, it is my opinion that no formula exists that could provide improved information for the purpose of replacing a prohibited byte sequence.

205. The claim element also requires that a replacement occur “in accordance with one or more formulae.” Given that Annexes B and D do not describe any replacement at all, they likewise does not disclose any formula for such a replacement and Dr. Drabik does not identify one.

206. Yet another flaw in Dr. Drabik’s infringement theory is that he shifts his analysis for this claim element to Annex D, whereas he analyzed Annex B for the prior element. Annex

D does not identify the “forbidden_zero_bit” or the prohibited byte sequences, nor does it disclose error mitigation for either.

207. In sum, Dr. Drabik has failed to identify any relation between the ‘514 patent and any processing associated with H.264 decoding. Consequently, standard H.264 decoding represents a non-infringing alternative to the ‘514 patent. Dr. Drabik proposes an alternative suggesting changes to how timestamps are treated in H.264. (Drabik Opening Report at ¶ 264.) However, Dr. Drabik’s infringement analysis did not refer to timestamps. Nor did Dr. Drabik’s general discussion of the ‘514 patent discuss timestamps. (Drabik Opening Report at ¶ 258.) Dr. Drabik’s reference to decoders that do not “... detect and mitigate timing errors” appears entirely out of context. (Drabik Opening Report at ¶ 265.)

208. If Dr. Drabik ever provides a proper explanation of why the Gandhi patent is essential to the H.264 Standard, I will examine and respond to his analysis. Until such time, I conclude that the Gandhi patent is not essential to any part of H.264.

(ii) **The H.264 Annex on which Dr. Drabik relies is optional and Dr. Drabik has not undertaken to show that any Microsoft product implements that Annex**

209. Finally, Annex D is optional for decoders. Annex D relates to Supplemental Enhancement Information that decoders do not need to process. Annex D states the following:

SEI messages assist in processes related to decoding, display or other purposes. However, SEI messages are not required for constructing the luma or chroma samples by the decoding process. Conforming decoders are not required to process this information for output order conformance to this Recommendation | International Standard (see Annex C for the specification of conformance). Some SEI message information is required to check bitstream conformance and for output timing decoder conformance.

(H.264 Standard at 322.) Moreover, Richardson’s H.264 textbook states this as well:

8.5 Supplemental Information

Supplemental Enhancement Information (SEI) and Video Usability Information (VUI) are parameters that may be transmitted as part of an H.264 bitstream. SEI and VUI parameters may be useful to a decoder but are not essential to the basic decoding process.

(Iain E. Richardson, The H.264 Advanced Video Compression Standard, 2nd Edition, at 248.)

Dr. Drabik has not undertaken, anywhere in his report, to show that any Microsoft product practices Annex D.

(iii) **There are well-recognized alternatives to performing error correction at the video coding layer**

210. Dr. Drabik contends that “the alternative at the time of the ‘514 Patent was not to adjust for the errors in the time stamp, which would result in substantial delay in displaying the video sequence.” (Drabik Opening Report at ¶ 264.) This analysis of an alternative does not make sense because, as I explained, the sections of H.264 to which Dr. Drabik alleges this patent relates do not make reference to errors in time stamps. Accordingly, there would be no need to find an alternative because H.264 does not appear to practice the functionality that Dr. Drabik references.

211. Dr. Drabik next contends that “[a] decoder that does not detect and mitigate timing errors will be more vulnerable to errors in the bitstream... .” (Drabik Opening Report at ¶ 265.) That is a truism but does not actually identify any relevant alternative or explain what type of performance benefit the Gandhi patent provides over that alternative. In actuality, there are a number of alternatives.

212. One alternative, and indeed an alternative that is currently practiced, is to handle error correction through communications protocols. Specifically, video is transmitted over communication channels and networks. Those channels and networks will provide error correction and error resiliency protocols suited to their own environments. In contrast, error correction and error resilience handled at the video coding layer cannot take into account the specific characteristics of networks because an encoder or decoder will not necessarily know the characteristics of the network over which the video will be transmitted.

213. For example, the ATSC standard for digital broadcast transmission provides error correction suitable for over-the-air transmission, including data randomization, Reed-Solomon encoding, convolutional byte interleaving, and trellis coding and intersegment symbol interleaving.⁶³ These techniques are applied independent of the underlying video coding standard. Similarly, data transmitted over communications networks such as the Internet typically make use of a suite of protocols – called “layers” – some of which include error detection and correction mechanisms. Techniques used include parity checks, block codes, hamming codes, polynomial codes, ARQ (automatic repeat request) protocols, and forward error correction. (*See* Telecommunications: Protocols and Design. John Spragins et al., 1991, at §§6.1-6.4.)

214. Another alternative is to implement the error mitigation technique that is actually described in the H.264 Standard and not the subject of MMI’s infringement claims. Specifically, rather than use frame overhead data to detect errors and then attempt to replace the corrupted data with improved data, one can adopt the approach described in Annex B of the H.264 Standard. Under this approach, upon noticing an error the decoder discards bitstream data until it can again align itself with the byte stream:

When an error in the bitstream syntax is detected (e.g., a non-zero value of the forbidden_zero_bit or one of the three-byte or four-byte sequences that are prohibited in subclause 7.4.1), the decoder may consider the detected condition as an indication that byte alignment may have been lost and may discard all bitstream data until the detection of byte alignment at a later position in the bitstream as described in this subclause.

(*See* H.264 Standard at 306.)

215. Finally, error mitigation in video coding appears in a host of prior art references. Techniques of this type were well-known in the field. As one example, U.S. Patent 5,910,827

⁶³ *See* ATSC Document A/53, available at www.atsc.org/cms/standards/a53/a_53-Part-2-2011.pdf, at § 5.2.

(“the ‘827 patent”) discloses an error mitigation technique. (‘827 Patent at Abstract.) The ‘827 patent explains:

Error detection circuitry is optionally integrated into the DDPE 34 to allow it to detect errors in the received data stream using any of a variety of techniques. For example, in certain applications, the error detection circuitry determines that an error has occurred in the received data stream when it detects a start code at an unexpected location in the received data stream. In other applications, an illegal codeword indicates an error in the received data stream.

(‘827 Patent at 5:13-20.) It also discloses error mitigation techniques by which it “replaces data corrupted with errors with replacement data generated as a function of a previous frame.” (‘827 Patent at Abstract.)

(iv) **The Gandhi patent is not “basic”**

216. Dr. Drabik’s analysis, even if accepted, relates to Annexes B and D. In paragraph 61 of his report, Dr. Drabik contended that Annexes, including Annexes B and D, merely provide “ancillary” information. While I do not adopt with Dr. Drabik’s “basic” versus “ancillary” distinction, I note that even under Dr. Drabik’s standards the Gandhi patent is merely “ancillary.”

61. Annexes to the H.264 Standard provide ancillary information. There are certain transport tools in Annexes B and C, which support robustness in the face of transport errors or fluctuating transport resources. Additionally, in practical implementations, circumstances arise which can complicate the decoding operation and degrade the user experience, such as transmission errors, finite time precision, and display format diversity. Annex D to the H.264 Standard provides ancillary information to manage such circumstances. Annex E also provides ancillary information to manage color accuracy.

(Drabik Opening Report at ¶ 61.) As an optional portion of the standard, these Appendices may or may not be implemented by H.264 decoders.

B. Litigation outcomes do not show that MMI's patents are important to H.264

217. Dr. Drabik's expert report states that "I have reviewed confidential Xbox 360 documentation, such as software, that describes the detailed operation of the Xbox 360 in connection with MMI's assertion of infringement of the '596 and '094 patents in the ITC Investigation No. 337-TA-752. In that investigation, the Administrative Law Judge determined that the Xbox 360 infringes the '596 and '094 patents." (Drabik Opening Report at ¶ 272.) Mr. Dansky's expert report states that MMI's patents have a "history of successful litigation." (Dansky Report at p. 98.)

i. United States litigation

218. Two patents have been litigated in the United States against Microsoft's Xbox: the '596 patent (a member of the Wang MBAFF family) and the '094 patent (from the Wang alternate scan family). Those patents were litigated before an Administrative Law Judge ("ALJ") as part of ITC Investigation No. 337-TA-752 ("the 752 case"). The ALJ's determination of infringement was based solely on Microsoft's tests, in which Microsoft applied bulk quantities of video content to its codec to confirm H.264 compliance. *See* ALJ Shaw's Initial Determination ("I.D.") at 115-116, 172. Those videos happened to include interlaced clips. (*Id.*) And further with respect to the '094 patent, the ALJ found that the mere capability to perform the processing described by the patent is sufficient for infringement, regardless of whether anyone actually uses Xbox in that manner. *See* I.D. at 115-116. The ALJ rejected MMI's indirect infringement arguments, which involved the extent to which customers use (and to which Microsoft encourages customers to use) interlaced video content. *See* I.D. at 129-130, 187. But the extent to which Microsoft's customers use the claimed features will have bearing on

royalty-related issues. In the 752 case, MMI failed to show that any customers ever use H.264 interlaced content. This can be seen through cross-examination testimony from Dr. Drabik, reproduced on the following pages:

<p>Dr. Drabik was not aware of any Xbox customers that used Xbox to decode interlaced content. (Drabik Transcript at 432.)</p>	<p>12 Q I'm talking about customers. Are you aware 13 of any Microsoft customers of Xbox using the Xbox to 14 decode interlaced H.264 content? 15 A I don't see why the distinction is 16 important. But apart from Microsoft employees who 17 played the content to test the Xbox, and myself, I'm 18 not specifically aware of any other user who has 19 tested that.</p>
<p>Dr. Drabik was not aware of any Microsoft-provided content for Xbox Live that was interlaced. (Drabik Transcript at 432.)</p>	<p>20 Q Okay. And you're not aware of any Microsoft 21 provided content for Xbox Live that uses interlaced 22 H.264 content, are you? 23 A I'm certainly not aware of any obstacle to 24 that provision. But I'm not aware of any such content 25 specifically, no.</p>
<p>Dr. Drabik was not aware of any Microsoft customer that used Xbox to practice the functionality of the '094 patent. (Drabik Transcript at 433.)</p>	<p>3 Are you aware -- you're not aware of any 4 customer of Microsoft using the Xbox H.264 decoder to 5 decode field scan content, are you? 6 A If Mr. Wu is not a customer -- because he 7 did decode field scan content -- then I am not aware 8 of any customer. I should state that I do not own an 9 Xbox, and therefore I am not a customer.</p>

<p>Dr. Drabik was not aware of any Xbox customer that used Xbox to practice the functionality of the '596 patent. (Drabik Transcript at 433.)</p>	<p>10 Q Are you aware of any Xbox customer who used 11 the H.264 decoder in Xbox to decode MBAFF video? 12 A My answer is the same with regard to the 13 exceptions of myself and Mr. Wu, not being customers.</p>
<p>Dr. Drabik was not aware of any Xbox games that used H.264. (Drabik Transcript at 420.)</p>	<p>5 Q Are you aware of any games that use the 6 H.264 decoder? 7 A Not specifically, no.</p>
<p>Dr. Drabik was not aware of any Xbox Live channels that would have required use of the functionality of either the '596 or '094 patents. (Drabik Transcript at 423.)</p>	<p>7 Q Have you analyzed any video channels that 8 are available for streaming video for Xbox via Xbox 9 Live to determine whether or not they use MBAFF or 10 whether they use the field scanner? 11 A No, I have not.</p>

219. Also in that litigation, testimony from Naveen Thumpudi confirmed that Xbox games and Xbox Live content do not make use of H.264 interlaced video. (Thumpudi Witness Statement, RX-386C.)

220. If anything, the 752 litigation confirmed that the '596 and '094 patents (along with MMI's entire portfolio of patents directed to interlaced video) are not commercially important to Microsoft Xbox.

ii. German litigation

221. Dr. Drabik also notes that German courts found that Microsoft products infringe patents within the Krause and Wu "adaptive block size" families. (Drabik Opening Report at ¶¶ 87, 102.) Here again, Dr. Drabik does not provide full context. I reviewed a declaration filed earlier in this litigation by Peter Chrocziel, an attorney at the law firm Freshfields Bruckhaus Deringer LLP. (*See* 2:10-cv-01823-JLR at Doc. No. 213.) I understand that in Germany, infringement and invalidity are adjudicated through two separate proceedings. The court adjudicating infringement required Microsoft to suspend its invalidity case in order to preserve another Microsoft defense called its "Orange Book defense." As a result, no court has ever assessed the validity of the Krause and Wu patent claims. Combined with MMI's positions in its infringement case, in which it contended various aspects of the claim language do not apply when reading the claims on a decoder (*see* my opening report at page 207), the German proceedings add little insight into the value of these patents. Moreover, this ruling in Germany does not provide a value for these patents or compare them with alternatives available to the JVT.

222. In addition, as I explained above, the claim scope of the Krause and Wu patents excludes software. These claims use "means plus function" form for all decoder claims, limiting

the scope based on what is disclosed in the specification, which does not disclose any software structures. I understand that “means” claims may have a different interpretation in Germany.

V. THE VALUE OF MMI’S PATENTS TO MICROSOFT’S USE OF THE H.264 STANDARD

A. Microsoft’s current products

i. Xbox 360s console (“Xbox”)

223. Dr. Drabik, throughout his report, identifies various uses of the Xbox (some of which are supported and some of which are merely speculative) and asserts that all of MMI’s patents at issue apply to this product. Dr. Drabik’s analysis paints with strokes that are too broad. To understand the extent to which an Xbox might practice MMI’s patents, one must identify and separately consider its common uses.

224. I have used an Xbox and am familiar with its functionality. The main sources of video content for Xbox are video games and Xbox Live. Some consumers also use their Xbox to watch DVDs. Uncommon, fringe uses of Xbox include watching user-generated video files from burned DVD’s or USB drives. A fringe use that was briefly supported but is currently not supported is watching television using the AT&T U-verse service. I will address each of these uses in turn.

a. Video games

225. Xbox video games do not use H.264. I reviewed the testimony of a Microsoft Engineer named Naveen Thumpudi from ITC Investigation No. 337-TA-752, a case in which I served as an expert. Mr. Thumpudi confirmed that Xbox does not use H.264 for game content because H.264 does not have the appropriate latency characteristics. Mr. Thumpudi’s relevant testimony is reproduced below.

- 17. What is your understanding of whether the H.264 decoder is used in gaming operations on the Xbox?**
- A: My understanding is that the H.264 decoder is not used in gaming operations. I am not aware of any games that use that decoder.
- 18. What is your understanding of whether game content for the Xbox is H.264 encoded?**
- A: My understanding is that game content is not H.264 encoded. I am not aware of any games that use that content encoded using H.264.
- 19. What is your understanding of whether game content for the Xbox is interlaced?**
- A: My understanding is that game content is not interlaced. I am not aware of any games that use interlaced content.
- 20. Can you explain whether H.264 would be suitable for games on the Xbox?**
- A: The Xbox H.264 decoder does not have sufficient latency characteristics for games. It would likely slow them down and ruin their playability.

RX-00386C

226. In fact, during his cross-examination as part of that litigation, Dr. Drabik conceded that he did not know of any Xbox games that use H.264.

2	Q	So are you aware of any game content that
3		uses the H.264 decoder that's at issue in this case?
4	A	Not specifically, no.
5	Q	Are you aware of any games that use the
6		H.264 decoder?
7	A	Not specifically, no.

(Drabik transcript at 420.) Certainly, Dr. Drabik's expert report does not present any evidence that Xbox games are encoded using H.264.

227. This undercuts an argument offered by MMI's economics expert Mr. Dansky. He suggests that Xbox introduced H.264 in order to maintain competitiveness with Nintendo Wii

and Sony Playstation. But those companies have historically competed primarily in the video game segment, where Microsoft's success has nothing to do with H.264.

b. Xbox Live

228. Aside from playing games, the primary manner by which Xbox users watch video content is through the Xbox Live service.⁶⁴ When a user enters the Xbox Live service, the user can select from a variety of "Apps," some of which provide video content. Not all Xbox users visit Xbox Live for videos. Some use Xbox live for other purposes, such as social networking through the Facebook app and listening to music through various radio apps.⁶⁵ For these uses, MMI's H.264 patents do not apply. Other apps provide video content. Examples include ESPN, Netflix, and YouTube. Screenshots from these Apps are shown below.



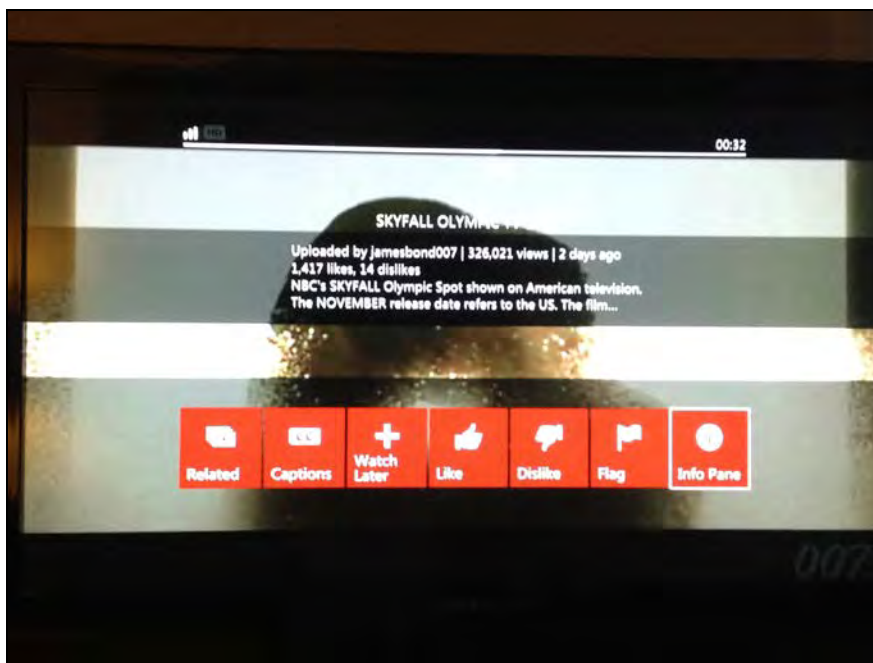
⁶⁴ <http://www.xbox.com/en-US/live/partners>

⁶⁵ <http://support.xbox.com/en-US/apps/browse>

Screenshot from ESPN app



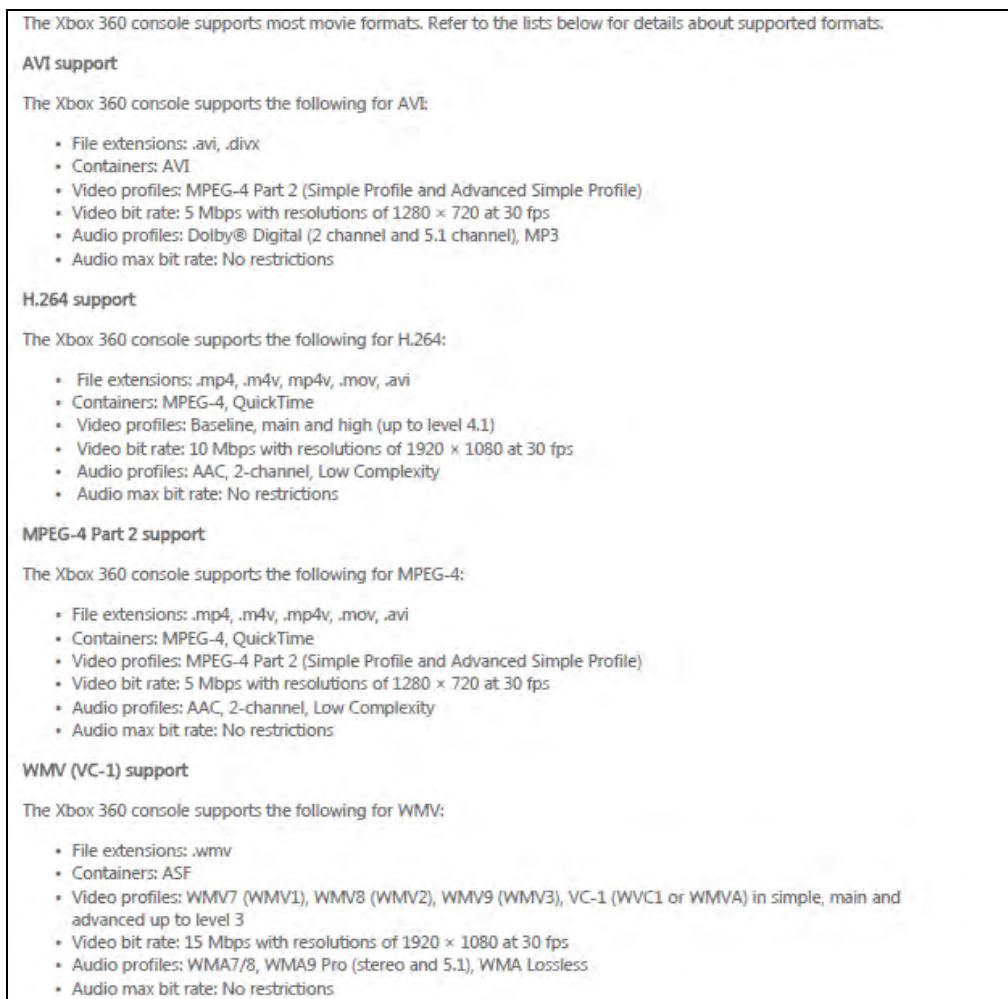
Screenshot from Netflix App



Screenshot from YouTube app

229. As with the Internet in general, not all video content will necessarily be H.264-encoded. Dr. Drabik's report states that "the Xbox360 can be used to play H.264-encoded

videos from Xbox Live,” but does not identify any examples of such content or explain the relative frequency of H.264 content as compared to other content. According to a Microsoft website, Xbox 360 supports many video format categories, only one of which is H.264:⁶⁶



For videos that do not use H.264, none of MMI’s patents apply.

230. Although Dr. Drabik did not identify any examples, some Xbox Live apps provide video content in H.264 format because the companies managing that app elected to use H.264 (*e.g.*, YouTube). But none of those apps will use H.264 interlaced content. All Xbox

⁶⁶ <http://support.xbox.com/en-US/xbox-360/settings-and-initial-setup/watch-dvds-movies>

Live video is progressive. The Xbox Technical Publisher's Guide (Version 1.2, published April 18, 2012) confirms this:

- Xbox LIVE Applications and the Xbox 360 Application Development Kit does not support playback of interlaced video content. Only progressive (non-interlaced) video content is supported.

(MS-MOTO_1823_00003900772 at 21.) In addition, I reviewed testimony from Microsoft engineer Naveen Thumpudi from ITC Investigation No. 337-TA-752. He explained that Xbox Live does not use interlaced video:

21. What is your understanding of whether streaming to Xbox uses interlaced H.264 encoding?

A: Users can stream media to Xbox using Xbox Live. The channels available to a user to stream content to Xbox via Xbox Live, such as Hulu, Netflix, or ESPN, **do not use interlaced H.264 encoding.**

(RX-00386C.) Dr. Drabik's testimony from ITC Investigation No. 337-TA-752 is consistent with this conclusion.

7 Q Have you analyzed any video channels that
8 are available for streaming video for Xbox via Xbox
9 Live to determine whether or not they use MBAFF or
10 whether they use the field scanner?
11 A No, I have not.

(Drabik Testimony at 423.) *See also* Lakeview Video Guidelines, MS-MOTO_1823_00004034174 ("Lakeview, Silverlight and mobile platforms only support playback of progressive (non-interlaced) video"). Fourteen out of the seventeen MMI patents at issue are specific to interlaced content and will not apply for any Xbox Live usage scenario.

231. In summary, MMI's patents only need to be analyzed for Xbox Live in the narrow situation where an Xbox user elects to use Xbox Live, elects to watch a channel that provides

video, and that video is H.264-encoded. Even then, the video content will be progressive, eliminating all but three of the MMI patents at issue. Of these three, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

c. Commercial DVDs

232. Xbox's include a DVD drive. A user can insert a DVD and enjoy a movie. Commercial DVD's, such as DVD's that one purchases or rents from stores and kiosks, do not use H.264. They use MPEG-2.⁶⁷ None of MMI's patents apply to this situation.

d. "Burned" DVD's and USB drives

233. Most consumers are familiar with commercial, store-bought or store-rented DVD's for watching movies. But DVD discs can also be used as a general file storage medium. Just as one can save files to a computer hard drive or (in earlier days of computers) to a floppy disc, one can save files to a DVD through a process called "burning." Computers sometimes come equipped with a drive that allows data to be burned to the DVD. Similarly, another general storage medium is called a USB drive. Consumers sometimes refer to small USB drives as "thumb drives."

234. Users can burn files to a DVD or save files to a thumb drive and then insert the DVD or thumb drive into an Xbox. If the file is for a video and if the Xbox has the appropriate codec for that movie, the Xbox will play the video. Generally, most consumers are unlikely to play video files from burned DVD's or from thumb drives very often.

235. As explained above, Xbox supports a variety of different codecs, only one of which is H.264. For video files that use any other codec, none of MMI's patents will apply. For

⁶⁷ <http://mpeg.chiariglione.org/> (listing DVD as use for MPEG-2).

video files that are H.264-encoded and that are progressive, all but three MMI patents are eliminated. Of these three, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

236. In summary, consumers are not likely to watch movie files from burned DVD's or thumb drives using their Xbox. Even when they do, many of those movie files might not be H.264-encoded.

237. Dr. Drabik explains in his report that he used Xbox 360 to play an H.264-encoded, interlaced video using a USB drive. The clip that he analyzed was named "hdforum1080i_main_h264_aff.mp4." (Drabik Opening Report, ¶ 274.) This is the same clip about which he testified in ITC Investigation No. 337-TA-752.

Q159: What is CPX-1?

A: It is a copy of the video clip that I played using the Xbox. The clip is entitled "hdforum1080i_main_h264_aff.mp4."

(CX-706C.) During cross examination, Dr. Drabik explained that MMI's lawyers gave him this clip.

Q So what content was that?

A I provided a video clip on a USB memory stick as per instructions provided on the Xbox in the case of the Xbox.

I analyzed the video clip as I set forth in my witness statement with the a la carte iStream software to verify that it was MBAFF content and had macroblock pairs coded selectively as frame or field macroblock pairs.

Q Where did you get the clip?

A That was provided by counsel.

Q Motorola's counsel?

A Yes.

(Drabik Transcript at 439.) At least at the time of his testimony, Dr. Drabik did not know where MMI's lawyers obtained the clip.

e. AT&T U-Verse

238. Dr. Drabik identifies AT&T's U-verse TV as a source of H.264 encoded content and in particular, interlaced content. Dr. Drabik does not provide sufficient analysis to show that U-verse practices the functionality accused of infringing MMI's patents at issue. Moreover, U-verse is a fringe use for Xbox's that is not even currently available.

239. Dr. Drabik identifies no sources showing that U-verse TV encodes content using any of the encoding techniques it claims are covered by its patents. Dr. Drabik only cites sources saying that U-verse TV uses interlaced content and that it uses H.264. But Dr. Drabik does not show that U-verse TV uses either MBAFF or PICAFF, the features described in over half of MMI's patents at issue. With respect to other clips, he found it necessary to perform professional testing using specialized software, such as the apparently pirated videos he downloaded from the internet or the video clip he was given by MMI's lawyers, but did not

perform any such testing on the U-verse content. Dr. Drabik does not say he analyzed any U-verse TV content to determine how it was encoded, instead relying on general citations to 1080i content he found on the Internet. Interlaced content was certainly known before MMI applied for its patents, and it is certainly possible that U-verse TV uses none of the techniques MMI accuses of infringing.

240. Second, Dr. Drabik does not analyze whether using Xbox to decode U-verse TV content could be an authorized use of MMI's patents. According to an MMI corporate blog, AT&T uses MMI encoders to encode at least some of its U-verse TV content.⁶⁸ It is my understanding that an AT&T customer can, without infringing, use an Xbox to decode content that was encoded using encoders that MMI sold to AT&T to create that content.

241. Third, Dr. Drabik does not analyze the value to Microsoft of supporting U-verse on Xbox. I note that according to AT&T's website, the kit that allows using Xbox with U-verse is no longer available.⁶⁹ Internet sources show that it was introduced in October 2010 and discontinued by May 2012.⁷⁰ From this, I can only conclude that having U-verse TV available on Xbox is not that important.

242. Even when U-verse was available, I believe it would have been a fringe usage scenario of Xbox and would not have been the primary way for households to watch U-verse content. According to AT&T documentation,⁷¹ Xbox 360 could be used as an additional U-verse

⁶⁸ <http://www.motorola.com/mediaexperiences2go/2010/03/motorola-driving-bandwidth-savings-for-u-verse-tv/>

⁶⁹ <http://www.att.com/u-verse/explore/xbox-receiver.jsp#fbid=5THgpRYC9cz>

⁷⁰ <http://www.multichannel.com/article/484484->

[AT T Suspends U verse TV On Xbox Option To Re Engineer Kit.php](#)

⁷¹ http://www.att.com/Common/merger/files/pdf/U-verse_Update.pdf

receiver. Internet sources I reviewed indicate customers had to have a standard U-verse receiver in order to use Xbox to view U-verse content.⁷² Customers were charged \$99 for a U-verse Xbox kit and a \$55 installation fee before they could use Xbox to watch U-verse content. In addition, I am not aware of Xbox having any DVR functionalities, meaning that in order for a household to use DVR, that household would need another primary set top box that could provide DVR functionalities. In short, to the extent Xbox was used as a U-verse receiver, it would have been a fringe scenario.

ii. Windows desktop operating systems, including Windows Vista, Windows 7, and Windows 8

a. Windows software does not always perform the relevant functionality

243. Dr. Drabik concludes that Windows desktop operating systems make use of MMI's H.264 patents. He relies on two pieces of evidence: i) a website about a Media Foundation Transform that supports decoding of several H.264 profiles; and ii) the ability for a computer running Windows 7 to play H.264 video clips. Dr. Drabik apparently did not undertake to determine when or whether the Windows operating system, as opposed to third party hardware or third party software, performs the video processing claimed in MMI's patents.

244. Media Foundation is a platform that supports multimedia content for Windows desktop operating systems.⁷³ The Media Foundation platform includes Media Foundation Transforms, which are software components or interfaces that provide specific functionality.⁷⁴

⁷² <http://www.multichannel.com/article/484484->

[AT T Suspends U verse TV On Xbox Option To Re Engineer Kit.php](#)

⁷³ [http://msdn.microsoft.com/en-us/library/windows/desktop/ms694197\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/desktop/ms694197(v=vs.85).aspx)

⁷⁴ [http://msdn.microsoft.com/en-us/library/windows/desktop/bb250382\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/desktop/bb250382(v=vs.85).aspx)

Dr. Drabik cited one such Transform called “Media Foundation H.264 video ddecoder.” That does not mean Microsoft Windows software, including Media Foundation software, natively provides the video processing functionality claimed by MMI’s patents.

245. For example, Microsoft desktop operating systems (and the Media Foundation platform) support a low-level API called DirectX.⁷⁵ Dr. Drabik did not consider DirectX. DirectX is a part of Windows that allows applications to make use of functionality in the computer’s hardware, as opposed to the operating system software, to render media content.⁷⁶ Windows 7 and Windows Vista use DirectX⁷⁷ and Windows 8 will use DirectX.⁷⁸ Offloading functionality to hardware improves performance. As such, the hardware components are often called “accelerators.”⁷⁹ DirectX allows applications to use hardware for aspects of H.264 decoding.⁸⁰ As stated in the DirectX Video Acceleration Specification for H.264:

In DXVA, some decoding operations are implemented by the graphics hardware driver. This set of functionality is termed the *accelerator*. Other decoding operations are implemented by user-mode application software, called the *host decoder* or *software decoder*. Processing performed by the accelerator is called *off-host* processing. Typically the accelerator uses the GPU to speed up some operations. Whenever the accelerator performs a decoding operation, the host decoder must convey to the accelerator buffers containing the information needed to perform the operation.

⁷⁵ See, e.g., <http://msdn.microsoft.com/en-us/directx/aa937781.aspx>; [http://msdn.microsoft.com/en-us/library/ms697062\(v=vs.85\)](http://msdn.microsoft.com/en-us/library/ms697062(v=vs.85))

⁷⁶ <http://blogs.msdn.com/b/b8/archive/2012/07/23/hardware-accelerating-everything-windows-8-graphics.aspx>

⁷⁷ http://download.microsoft.com/download/5/f/c/5fc4ec5c-bd8c-4624-8034-319c1bab7671/DXVA_H264.pdf (indicating DirectX available in Windows Vista and later); [http://msdn.microsoft.com/library/ee416788\(VS.85\).aspx](http://msdn.microsoft.com/library/ee416788(VS.85).aspx) (indicating Vista comes with DirectX 10 and can be updated to DirectX 11 and Windows 7 comes with DirectX 11).

⁷⁸ <http://blogs.msdn.com/b/b8/archive/2012/07/23/hardware-accelerating-everything-windows-8-graphics.aspx>.

⁷⁹ <http://blogs.msdn.com/b/b8/archive/2012/07/23/hardware-accelerating-everything-windows-8-graphics.aspx>

⁸⁰ <http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=11323>

(See http://download.microsoft.com/download/5/f/c/5fc4ec5c-bd8c-4624-8034-319c1bab7671/DXVA_H264.pdf). Dr. Drabik did not analyze or even consider that in a modern computer running a Windows desktop operating system, application developers will prefer that the hardware, not the operating system software, perform decoding operations.

246. And as I explained in my opening report, application software responsible for rendering video content (such as Adobe Flash) often will also decode that content, without relying on the operating system. (See my opening report at p. 232-233.) Dr. Drabik did not consider what part of a modern computer is responsible for decoding H.264 content. Letting third party graphics hardware decode H.264 video is faster and certainly a viable alternative to decoding at the operating system level. At least for Windows 7, based on my discussion with Microsoft engineer Yongjun Wu, only very inexpensive computers will have hardware that cannot provide the relevant decoding capability. For the vast majority of Windows 7 installations, third-party hardware will perform the decoding.

b. Situations in which a Windows-based PC might be used to decode H.264 and the extent to which MMI's patents apply to Microsoft' software

247. There are four main sources of video on a modern personal computer: 1) the Internet, 2) playback of commercial DVD's or Blu-rays, 3) applications that use video processing, such as computer games, and 4) user-generated content, such as videos transferred from a digital video camera.

248. ***The Internet:*** Internet content includes a wide variety of video formats. Some of this video content will be streamed (such as through YouTube or other streaming services) and some content might be downloaded as standalone files that a user can later open.

249. A computer running Microsoft windows will support many of these video formats. For example, the Media Foundation platform that Dr. Drabik cites also supports various

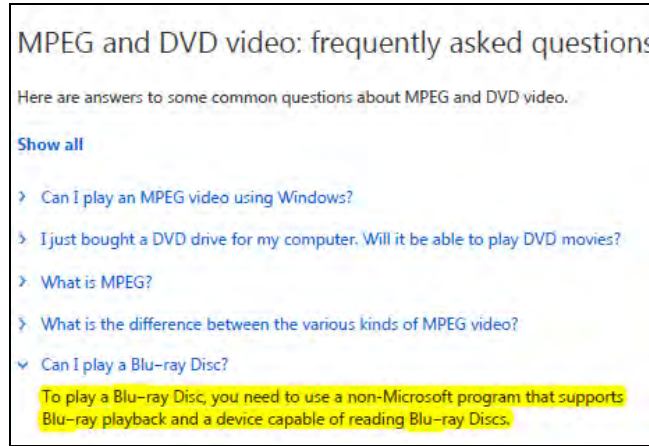
MPEG and Windows Media formats.⁸¹ For content other than H.264, MMI's patents do not apply.

250. For H.264 content, the only patents that must be analyzed are MMI's three patents that could relate to non-interlaced content. The remaining fourteen patents relate to interlaced coding tools. As I have explained both earlier in this report and in my opening report, interlaced coding is not relevant on the Internet. Moreover, MMI's three non-interlaced patents usually will not apply to a Microsoft product because the rendering application software may provide native decoding functionality or the underlying graphics hardware (through DirectX) may provide the decoding functionality. And of the three non-interlaced patents, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

251. **Commervial DVD's:** Consumers sometimes watch store-bought or store-rented DVDs on their personal computers. As I explained earlier, DVD's use MPEG-2. In this situation, none of MMI's patents are relevant.

252. **Commercial Blu-rays:** Consumers sometimes watch store-bought or store-rented Blu-rays on their personal computers. Microsoft does not provide the software that allows a computer to render Blu-ray. A consumer or the computer manufacturer must obtain that software from another company.

⁸¹ [http://msdn.microsoft.com/en-us/library/windows/desktop/dd757927\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/desktop/dd757927(v=vs.85).aspx)



(See <http://windows.microsoft.com/en-US/windows7/MPEG-and-DVD-video-frequently-asked-questions>.) In this situation, none of MMI's patents are relevant to any Microsoft product.

253. ***Applications that render video, such as computer games:*** Whether video-based applications, such as computer games, use H.264 will depend on how the application developer elected to encode the application's video. Dr. Drabik has not identified any PC applications that use H.264 coding and rely on the operating system to render the video. A variety of codecs exist, including MPEG-2, MPEG-4 part 2, or WMV. And as explained above, the computer component that decodes the video will likely be third-party graphics hardware, not Microsoft software.

254. ***User-generated content:*** Consumers sometimes open stand-alone movie files that are saved on their computer or that are saved on DVD's or USB drives. Other than the Internet (which I already discussed above), those files might come from digital video cameras. For cameras that capture video in non-H.264 formats, none of MMI's patents apply. For digital video cameras that encode in H.264, the number of applicable patents will depend on the camera. For cameras that capture in progressive mode, all but three of MMI's patents are eliminated. Of these three, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

c. Alleged PC television viewing functionality

255. MMI's expert Mr. Dansky suggests that television plays a relevant role for video content on PC's running Microsoft Windows. (*See* Dansky Opening Report at 120-121.) Mr. Dansky explains neither the circumstances in which nor the mechanics of how this occurs.

256. A consumer can watch two forms of television on a PC running Microsoft Windows: Internet-based television⁸² or broadcast television.⁸³ Internet-based television allows a user to view content from Internet sources such as Netflix. As I explained above, this video content will likely be decoded by a third party hardware accelerator, not by Microsoft's software. In addition, Internet content is progressive.⁸⁴ That eliminates all MMI's interlaced patents. Of the remaining three patents, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

257. The second form of television – broadcast TV – is more complicated to watch on a PC. A consumer must first buy a television tuner or other device (such as a card) that can accept television input.⁸⁵ Next, the consumer must plug one end of the tuner (or other device) into the computer and feed a television signal into the other end of the tuner.⁸⁶ The type of

⁸² <http://windows.microsoft.com/en-US/windows7/products/features/internet-tv>

⁸³ <http://windows.microsoft.com/en-US/windows-vista/TV-signals-that-are-supported-by-Windows-Media-Center>

⁸⁴ This puts aside the two purely academic examples that Dr. Drabik cited in his opening report: one pirated video and one test video that likely was also pirated.

⁸⁵ <http://windows.microsoft.com/en-us/windows-vista/Watch-TV-in-Windows-Media-Center>

⁸⁶ <http://windows.microsoft.com/en-us/windows-vista/What-should-I-know-before-adding-TV-tuners-to-use-with-Windows-Media-Center>

signals that the PC can process will depend on a variety of factors.⁸⁷ As I explained in my opening report, television can be broadcast “over the air” or through cable and satellite set-top box services. “Over the air” broadcasts can usually be fed through a tuner and into a PC, but the United States broadcast television industry does not use H.264. *See* ATSC Document A/53.

258. Signals from cable or satellite providers that rely on set-top boxes usually cannot be fed through the tuner and into the PC.⁸⁸ Those signals require special set-top boxes that decrypt and then decode the signal. Once decoded, the signal can be sent to the PC through some other medium. MMI’s patents are not implicated in this scenario because the television signal has already been decoded by the set top box and is no longer in H.264 form, even if it ever was. For example, Microsoft documentation indicates that signals from a cable or satellite set-top box require an analog tuner (i.e., an old fashioned non-digital tuner) feeding into the PC, confirming that the set-top box will have already decoded the video.

If your TV signal comes from	You need this type of tuner	You need this additional hardware
A cable or satellite set-top box	Analog tuner (the set-top box converts the digital HDTV signal to an analog standard-definition signal)	None
An over-the-air antenna	HDTV tuner	None
A cable TV jack in the wall (no set-top box)	Digital Cable Tuner (a special kind of digital TV tuner built-in to Digital Cable Ready computers)	A Digital Cable Ready computer, a TV or monitor that supports High-Definition Copy Protection (HDCP) over DVI or HDMI, and a CableCARD from your cable provider.

⁸⁷ <http://windows.microsoft.com/en-US/windows-vista/TV-signals-that-are-supported-by-Windows-Media-Center>

⁸⁸ <http://windows.microsoft.com/en-US/windows-vista/TV-on-your-computer-Understanding-TV-signals-and-TV-tuners> (see “HDTV digital scenarios”); <http://windows.microsoft.com/en-US/windows-vista/TV-signals-that-are-supported-by-Windows-Media-Center>

(<http://windows.microsoft.com/en-US/windows-vista/TV-on-your-computer-Understanding-TV-signals-and-TV-tuners>.)

259. The only remaining category of television is basic digital cable that comes to a user straight from the wall – i.e., cable that does not require a set top box. This scenario has become increasingly rare. Microsoft’s documentation indicates that this content can be fed through a specialized tuner and requires additional specialized hardware components, such as a “Digital Cable Ready” computer with a “CableCard” provided by the cable provider, as shown in the chart above. This is a very rare setup for any ordinary consumer. Even then, the ability to use this setup will likely depend on policies and restrictions of a customer’s local cable provider. Putting even all that aside, local cable providers may not use H.264. Local cable providers have a variety of encoding options available to them. Certainly, none of MMI’s experts have endeavored to determine what type of encoding local cable providers employ.

260. In sum, there are no commercially relevant situations in the United States in which a consumer’s computer will decode H.264 content from a television broadcast. There may be some “over the air” H.264 transmissions in foreign countries that can be fed into a PC, but that will not occur for customers that receive content through set top boxes. Moreover, third party hardware and not Microsoft software is likely to perform the H.264 decoding.

d. Other uses of an operating system unrelated to video coding

261. Dr. Drabik also does not consider that a modern operating system performs a great many tasks aside from video coding. In that context as well, MMI’s patents have marginal value to Microsoft products.

262. Features provided by a modern operating system can be internal or user-facing. Internal features are usually not noticeable by an ordinary consumer, but an operating system’s ability to perform those tasks are important for a commercially competitive product. For

example, an important role for an operating system is to schedule tasks efficiently among the many software applications running at any given time. Another important role for an operating system is to mediate between hardware and software, ensuring that hardware devices (such as a keyboard and mouse, battery, computer processors, Internet interfaces, or memory) can communicate with applications that require functionality from that hardware. Yet another example is the operating system's role of policing the security and stability of the computer – containing the impact of malicious software and protecting hardware from being corrupted. If an operating system performs poorly with these tasks, the computer will be sluggish and unstable. Operating systems develop reputations over time for their overall speed, stability, and security. These aspects of an operating system are important to the value a customer places on an operating system product. These aspects are extremely complex, involving a great many software components carefully coded and assembled by teams of programmers over periods of years.

263. Other aspects of an operating system are user-facing. For example, I visited Microsoft's website to find the "features" it currently advertises to ordinary customers. (*See* <http://windows.microsoft.com/en-US/windows7/products/features>.) A small handful of those features will require video coding, but the vast majority do not. I have listed below every feature listed on the website. Many of these features are actually feature categories, for which one could further list component features. The point, however, is that a modern operating system has an enormous number of features relevant to consumers.

User-facing features listed in Microsoft's customer-oriented documentation ⁸⁹ :
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⁸⁹ <http://windows.microsoft.com/en-US/windows7/products/features>

Accessibility; Action Center; Aero; Audio and video; Backup and Restore; BitLocker; Calculator; Desktop; Device management; DirectX 11; Email; Gadgets; Games Explorer; Getting Started; HomeGroup; Internet Explorer; Internet TV; Jump Lists; Language packs; Libraries; Location-aware printing; Movie Maker; Multiplayer games; Networking; Paint; Parental Controls; Peek; Performance improvements⁹⁰; Photo Gallery; Play To; Power management; ReadyBoost; Remote Desktop Connection; Remote Media Streaming; Shake; Snap; Snipping Tool; Startup Repair; Sticky Notes; System Restore; Tablet PC; User Account Control; Windows Anytime Upgrade; Windows Connect Now; Windows Defender; Windows Easy Transfer; Windows Essentials; Windows Experience Index; Windows Fax and Scan; Windows Firewall; Windows Media Center; Windows Media Player 12; Windows Mobility Center; Windows Search; Windows Taskbar; Windows Touch; Windows Troubleshooting; Windows Update; Windows XP Mode; WordPad; XPS.

264. A modern operating system derives value from an extremely large number of features and capabilities. Video coding is one aspect. Within video coding, H.264 is one option. The value of MMI's patents to Microsoft's operating system products would have to be viewed in this technological context.

iii. Windows Phone 7 (and 7.5)

265. Windows Phone 7 is an operating system for mobile devices. Dr. Drabik contends that Windows Phone 7 supports Baseline, Main, and High profiles of H.264. (Drabik Opening Report at ¶ 273.) On that basis, he concludes that MMI's essential patents apply to this operating system. (Drabik Opening Report at ¶ 275.) But the very website on which Dr. Drabik

⁹⁰ This lists other features, including "Sleep and Resume," "Search," "USB devices," and "better memory use."

relied shows that Windows software does not provide H.264 support. Rather, processors from another company include hardware accelerators that provide H.264 support:

Video codecs supported by the Qualcomm 7x27a processor on Windows Phone							
Codec	H.263	VC1	VC1	MPEG-4 Pt 2	H.264	H.264	H.264
Containers	3GP, 3G2	WMV	WMV	3GP, 3G2, MP4, M4V	3GP, 3G2, MP4, M4V, MOV	3GP, 3G2, MP4, M4V, MOV	3GP, 3G2, MP4, M4V, MOV
Profile	0	Simple	Main	Simple	Baseline	Main	High
Level	30	Main	Low	3	2.0	1.3 - CABAC, 2.0 - CAVLC	1.3 - CABAC, 2.0 - CAVLC

Video codecs supported by Qualcomm 8x50 and 8x55 processors on Windows Phone										
Codec	H.263	VC1	VC1	VC1	MPEG-4 Pt 2	MPEG-4 Pt 2	MPEG-4 Pt 2 (for 512-MB devices)	H.264	H.264	H.264
Containers	3GP, 3G2	WMV	WMV	WMV	3GP, 3G2, MP4, M4V	3GP, 3G2, MP4, M4V	3GP, 3G2, MP4, M4V, MOV	3GP, 3G2, MP4, M4V, MOV	3GP, 3G2, MP4, M4V, MOV	3GP, 3G2, MP4, M4V, MOV
Profile	0	Simple	Main	Advanced	Simple	Advanced Simple	Simple	Baseline	Main	High
Level	40	Medium	Medium	L1	3b	3b	5	3.1	3.1	3.1

(<http://msdn.microsoft.com/en-us/library/ff462087%28VS.92%29.aspx>.) Accordingly, Dr.

Drabik appears not to have investigated what part of a phone running Windows Phone software provides H.264 functionality. Based on the document above, I conclude that none of MMI's patents apply to Microsoft's Windows Phone 7 operating system.

266. Even putting that aside, Windows Phone 7 will likely draw video content from the Internet. As I have explained above, interlaced video is not relevant on the Internet.

Accordingly, Motorola's interlaced patents – the vast majority of its portfolio – will not apply to the decoding performed to watch videos on a mobile device running Windows Phone 7.

267. Moreover, Dr. Drabik's assertion that Windows Phone 7 provides support up to H.264 Level 3.1 is mistaken. Even putting aside that Windows Phone 7 software itself does not appear to provide H.264 support at all, only one of the two categories of phones listed in the website Dr. Drabik cites will support Level 3.1. Phones running the Qualcomm 7x27a support Level 2. Level 2 does not support interlaced video content, to which fourteen of MMI's patents are limited. *See* March 2010 version of H.264 Standard, at Table A-4 (constraining frame_mbs_only_flag).

268. Finally, consumers use Windows Phone to perform an extremely large number of tasks unrelated to video coding. As I explained above in connection with desktop operating systems, some aspects are internal and some are user facing. Because a smartphone is so similar to a PC in that both are computing devices, the internal aspects of a mobile operating system will be architecturally similar to a desktop operating system. As such, a mobile operating system will include behind-the-scenes functionality such as scheduling, hardware/software interactions, security, and stability. These aspects are extremely complex, involving innumerable software components carefully coded and assembled by teams of programmers over periods of years.

269. And as with desktop operating systems, mobile operating systems include user-facing features. I went to the Microsoft consumer-facing website in which it lists Windows Phone 7 features. (<http://www.microsoft.com/windowsphone/en-us/features/default.aspx>.) That website lists a number of features of interest to a consumer, some of which might benefit in part from video coding, but many of which are not related to video coding.

User-facing features listed in Microsoft's customer-oriented documentation:⁹¹

People Hub; Groups; Threads; Email featuring Outlook Mobile; Pictures Hub + Camera; The apps you want⁹²; Start Screen + Live Tiles; Marketplace Hub; Games Hub featuring Xbox LIVE; Music + Videos Hub; Office Hub; Internet Explorer; Local Scout; One button to Bing

iv. **Windows Embedded**

270. Dr. Drabik alleges that Windows Embedded makes use of H.264. He cites one very particular example in which a Windows Embedded product might decode H.264 content. In that particular example, the document he cites confirms that the default decoder is a hardware decoder provided by a company other than Microsoft. Software decoders will be used only if the hardware decoder cannot successfully decode the video content. Even there, Dr. Drabik does not show whether the software decoder comes from Microsoft or from another company.

271. Windows Embedded is an operating system platform provided to other businesses for use in specialized computing systems. Windows Embedded is not used in general purpose personal computers, handhelds, or tablets. Businesses can incorporate Windows Embedded into their specialized computing systems, customize aspects of Windows Embedded, and create customized software around Windows Embedded in order to provide an operational product.⁹³

272. Examples of computing systems that might use Windows Embedded include ATM machines, barcode scanners, electronic kiosks, multi-function printers, automotive systems

⁹¹ <http://www.microsoft.com/windowsphone/en-us/features/default.aspx>

⁹² This item on Microsoft's website further listed examples of apps to which consumers might be drawn.

⁹³ <http://www.microsoft.com/windowseembedded/en-us/evaluate/what-is-windows-embedded.aspx>

such as navigation systems, workout equipment, or building control systems.⁹⁴ As can be seen from this list, the computing systems that use Windows Embedded are usually highly specialized. The extent to which any of these systems would use H.264 will depend on the system at hand. For the vast majority of systems that Microsoft lists under “Device Type”⁹⁵ as being applicable for Windows Embedded, H.264 would not be used. For example, one would not expect to see H.264-coded video content on a treadmill, navigation system, printer, barcode scanner, or any of the other examples I listed above. Accordingly, for the vast majority of Windows Embedded applications, MMI’s patents are not relevant.

273. Dr. Drabik cites only one example in which Windows Embedded allegedly makes use of H.264: systems that use an Embedded version of Internet Explorer for which the system provider wants to support Adobe Flash playback.⁹⁶ In my review of Microsoft’s list of 33 exemplary devices that use Windows Embedded, only a few could conceivably benefit from an Internet browser, and fewer still would benefit from Adobe Flash playback. And even for such rare devices, Microsoft’s documentation shows that the hardware should provide H.264 decoding.

⁹⁴ <http://www.microsoft.com/windowseMBEDded/en-us/evaluate/world-of-windows-embedded-devices.aspx>

⁹⁵ <http://www.microsoft.com/windowseMBEDded/en-us/evaluate/world-of-windows-embedded-devices.aspx>

⁹⁶ <http://msdn.microsoft.com/en-us/library/gg154355>

You can configure the Adobe Flash Player ActiveX control by using this registry value, located in the key **HKEY_LOCAL_MACHINE\Software\Adobe\Flash\H264Profile**.

Name	Type	Description	Default Value
Max supported profile	REG_DWORD	Enables high-quality video playback on devices that support DirectShow hardware decoding .	None

Remarks

The **Max supported profile** registry key is not set by default. You can add this registry key to indicate the highest H.264 profile that your **hardware accelerated DirectShow filter video decoder** supports.

If this registry key is set and video content is encoded in a profile greater than the **Max supported profile** registry value, then the Adobe Flash Player ActiveX control uses the default software decoder to decode video. If the video content is encoded in a profile less than or equal to the registry value, then the Adobe Flash Player ActiveX control uses the **hardware accelerated decoder to decode video**.

If this registry key is not set and your OS design includes a hardware accelerated DirectShow filter video decoder, then the Adobe Flash Player ActiveX control attempts to decode all H.264 video content by using the hardware accelerated decoder.

Set the registry value to the highest available profile supported by the **hardware decoder**, based on the following table:

(<http://msdn.microsoft.com/en-us/library/gg469865.aspx>.)

274. Software decoders are only used in situations where the available hardware decoder cannot support the video content. Dr. Drabik has provided no indication of where this default software decoder exists or who provides it. In fact, Adobe's Flash player software likely decodes the content in the event that the hardware does not.

- Prior to Flash Player version 9, Flash Player did not support H.264.
- In Version 9, Adobe introduced an H.264 codec that appears to provide H.264 decoding through Flash Player's native software. *See* <http://www.adobe.com/support/documentation/en/flashplayer/9/releasenotes.html> ("H.264/HE-AAC codec support: Flash Player 9 Update 3 includes H.264 video and High Efficiency AAC (HE-AAC) audio codec support"); <http://www.adobe.com/press/articles/article.asp?p=1381885&seqNum=2> ("The powerful AVC/H.264 codec was also added to Flash Player 9.0.115").

- In Version 10, Adobe provided features by which decoding functionality was off-loaded to hardware accelerators. See <http://helpx.adobe.com/flash-player/release-note/release-notes-flash-player-10.html> (hardware-based stuff) (“**H.264 video hardware decoding:** Flash Player 10.1 introduces hardware-based H.264 video decoding to deliver smooth, high quality video with minimal overhead across mobile devices and PCs.”)

None of these documents suggest that operating system software decodes H.264 video.

275. And finally, the only commercially relevant Internet content is progressive, and fourteen MMI patents at issue are specific to interlaced coding tools. Even if one considers the very rare circumstance in which Windows Embedded is used in a device that provides a web browser, the rarer circumstance in which the systems provider wishes to allow Adobe Flash playback, the still-rarer circumstance in which the hardware decoder cannot support the video, and then further makes the less-than-likely assumption that a Microsoft software decoder rather than Adobe Flash player’s codec will step in, MMI’s interlaced patents are still inapplicable. Of the three remaining patents, the ‘419 patent is expired and does not cover software, the ‘968 patent will expire early next year and does not cover software, and the ‘514 patent is not used by H.264.

v. Silverlight

276. Dr. Drabik contends that Microsoft’s Silverlight supports the Baseline, Main, and High profiles of H.264. (Drabik Opening Report at ¶ 273.) On that basis, he concludes that all MMI’s allegedly essential patents, including those related to interlaced coding, apply to Silverlight.

277. Dr. Drabik is mistaken. The website that Dr. Drabik identifies to determine Silverlight’s supported profiles also states that Silverlight does not support interlaced video. In

the capture below, I have highlighted the line that Dr. Drabik apparently relied on and highlighted and boxed the line that Dr. Drabik apparently neglected to consider.

- H264 (ITU-T H.264 / ISO MPEG-4 AVC) formats

- Supports H.264 and MP43 codecs.

- Supports Base, Main, and High Profiles.

- Windows Phone 7 supports up to Level 3.0.

Note that level 3.0 defines the maximum supported resolution for 30fps as 720x480. Other frame rates have different maximum supported resolutions.

- Supports only progressive (non-interlaced) content.

- Supports only 4:2:0 chroma subsampling profiles.

- Desktop Silverlight only supports the Annex B NAL format (i.e. start codes).

Note, that media libraries, such as the SmoothStreamingMediaElement, support the AVC NAL format by programmatically converting AVC NALs to Annex B NALs. As Silverlight supports partial encryption of H.264 samples, this conversion can occur on encrypted content as well if the NAL headers are not encrypted. The Annex B NAL format is described in MPEG-4 Part 10.

- Supports PlayReady DRM with Mp4 (H264 and AAC-LC)

(<http://msdn.microsoft.com/en-us/library/cc189080%28v=vs.95%29.aspx>,

MOTM_WASH1823_0602897.) In the instances where Silverlight processes H.264 content, MMI's interlaced patents do not apply. Of the remaining three patents, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

278. Moreover, Silverlight supports many other video formats, including uncompressed video, Windows Media videos, and MPEG-4 Part 2. When those formats are used, none of MMI's patents apply.

vi. **Zune for Windows and Expression**

279. Zune was a portable media player that Microsoft has discontinued. It is unclear whether Dr. Drabik is identifying the Zune device itself or Zune software. The Zune device

itself only supports Baseline, meaning MMI's interlaced patents do not apply. This is apparent from the specification that Dr. Drabik cites. (MOTM-WASH1823_0603282-288.) That specification discusses H.264's Main profile in one location:

Supported formats for Zune software

The following codecs and formats can be imported and played back on a computer that has Zune software installed as the default media player. Zune software can also automatically synchronize these content formats to a Zune device, **converting the content to a supported format if necessary.**

Audio

- Windows Media Audio (.wma) - all bit rates
- MP3 (.mp3) - all bit rates
- AAC (.mp4, .m4a, .m4b, .mov) - all bit rates, Low Complexity (LC)

Video

- Windows Media Video (.wmv) - all bit rates and resolutions
- MPEG4 (.mp4, .m4v, .mov) - Simple profile, all bit rates and resolutions
- **H.264** (.mp4, .m4v, .mov) - Baseline and **Main profiles**, all bit rates and resolutions
- DVR-MS (.drv-ms) - standard definition Windows Media Center DVR recordings, Windows Vista Home Premium and Ultimate only

280. This is not describing the formats that Zune actually supports, but rather formats that Zune software either supports *or can convert into a Zune-supported format*. The actual supported Zune formats are listed further down the page. Zune 4GB, 8GB, and 80GB support Baseline, not Main:

Supported formats for Zune 4GB, Zune 8GB, and Zune 80GB

Audio

- Windows Media Audio Standard and Pro (.wma) - up to 550 Kbps, CBR and VBR, up to 48-kHz sample rate
- Windows Media Audio Lossless (.wma) - up to 1.5Mbps, up to 48-kHz sample rate
- MP3 (.mp3) - up to 320 Kbps, CBR and VBR, up to 48-kHz sample rate
- AAC (.mp4, .m4a, .m4b, .mov) - up to 320 Kbps, Low Complexity (LC), up to 48-kHz sample rate

Video

- Windows Media Video Simple Profile (.wmv) - up to 320x240, 10fps and 1.5 Mbps
- Windows Media Video Main Profile (.wmv) - up to 720x480, 30fps and 3 Mbps
- **H.264 baseline profile** video with AAC audio (.mv4, .mp4) - up to 720x480, 30fps and 2.5 Mbps
- MPEG4 Part 2 simple profile video with AAC audio (.mv4, .mp4) - up to 720x480, 30fps and 2.5 Mbps

Pictures

- JPEG (.jpg) - up to 640x480

281. Zune 30GB does not support H.264:

Supported formats for Zune 30GB

The following codecs and formats can be synchronized and played back on Zune 30GB with firmware 2.1 or later.

Audio

- Windows Media Audio Standard and Pro (.wma) - up to 550 Kbps, CBR and VBR, up to 48-kHz sample rate
- Windows Media Audio Lossless (.wma) - up to 1.5 Mbps, up to 48-kHz sample rate
- MP3 (.mp3) - up to 320 Kbps, CBR and VBR, up to 48-kHz sample rate
- AAC (.mp4, .m4a, .m4b, .mov) - up to 320 Kbps, Low Complexity (LC), up to 48-kHz sample rate

Video

- Windows Media Video Simple Profile (.wmv) - up to 320x240, 10fps and 1.5 Mbps
- Windows Media Video Main Profile (.wmv) - up to 720x480, 30fps and 3 Mbps

Pictures

- JPEG (.jpg) - up to 640x480

282. Microsoft instructs developers to use H.264 Baseline when encoding content for Zune:

Encoding Video for the Zune Device

Whether you are creating video from scratch or already have a finished video, you will want to encode the content using the parameters specified in this section to ensure the content synchronizes and plays on a Zune device without the need for conversion. For long videos, this conversion may take a considerable amount of time. To provide the best possible import and sync experience you should encode content that doesn't need to be converted. The following formats are recommended to sync directly to the device and allow for the best combination of quality and long battery life:

- **Format:** Windows Media Video (.wmv), H.264, MPEG4 (part 2). Additionally, H.264 and MPEG4 part 2 files should be inside an m4v or mp4 container.
- **Video codec:** WMV9 for Windows Media Video 9 (Simple and Main Profiles), AVC1 for H.264 (Baseline Profile), M4S2 for MPEG-4 (part 2, Simple Profile)
- **Video resolution:** 320x240
- **Video peak bit rate:** up to 1.5Mbps
- **Complexity or profile:** Simple and Main profile for WMV9 (CBR and VBR), **Baseline Profile for H.264**, and Simple Profile for MPEG-4
- **Audio codec:** Windows Media Audio (.wma) for Windows Media Video 9, AAC for H.264 and MPEG-4
- **Maximum audio bit rate:** 128kbps
- **Maximum total bit rate:** 1.692 Mbps

283. In short, Zune supports Baseline. That is significant because, as I explained in my opening report, Baseline does not include interlaced coding tools. MMI's interlaced patents do not apply, leaving only three other patents. Of these three, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

284. The Zune software that converts H.264 Main content into another form is hardly a commercially significant use of MMI's technology. The Zune software is used to, among other things, to *remove* interlacing as to convert video into Baseline form before the video is

transferred to a Zune device. In other words, the Zune software seeks to undo the aspects of H.264 to which MMI's patents relate.

285. Moreover, as shown by the excerpts above, Zune and Zune software supported many video codecs other than H.264. Dr. Drabik has not indicated the extent to which Zune or Zune software was used as compared to these other codecs. For the situation where a codec other than H.264 was used, or in which Zune was used to play music, none of MMI's patents apply.

vii. Skype

286. Skype is an Internet-based messaging, voice chatting, and video chatting service. None of MMI's interlaced patents apply to Skype because Skype only supports the Constrained Baseline profile. Dr. Drabik agrees. (Drabik Opening Report at ¶ 273.) Constrained Baseline does not use interlaced coding tools. (*See* Iain E. Richardson, The H.264 Advanced Video Compression Standard, 2nd Edition, at 225.) Of the remaining three patents, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264.

287. In ¶ 277 of his report, Dr. Drabik asserts that the '094 patent applies to Skype. He is mistaken. The '094 patent relates to the 4x4 alternate field scan. It is an interlaced coding tool and is not used for progressive video. Progressive video is encoded in frame mode, which uses the zig-zag scan. (*See* March 2010 H.264 Standard at § 0.6.2, 8.5.6.)

viii. Lync

288. Microsoft Lync is a communications platform that allows users to engage in a variety of applications, such as IM, audio conferencing, video conferencing, web conferencing, and telephone calls. It is provided as a software client for a variety of environments, including Windows, Macs, and mobile devices.

289. MMI's interlaced patents do not apply to Lync. That is because Lync supports four H.264 profiles, none of which support interlaced coding. The four profiles are: Constrained Baseline, Constrained High, Scalable Constrained Baseline, and Scalable Constrained High.

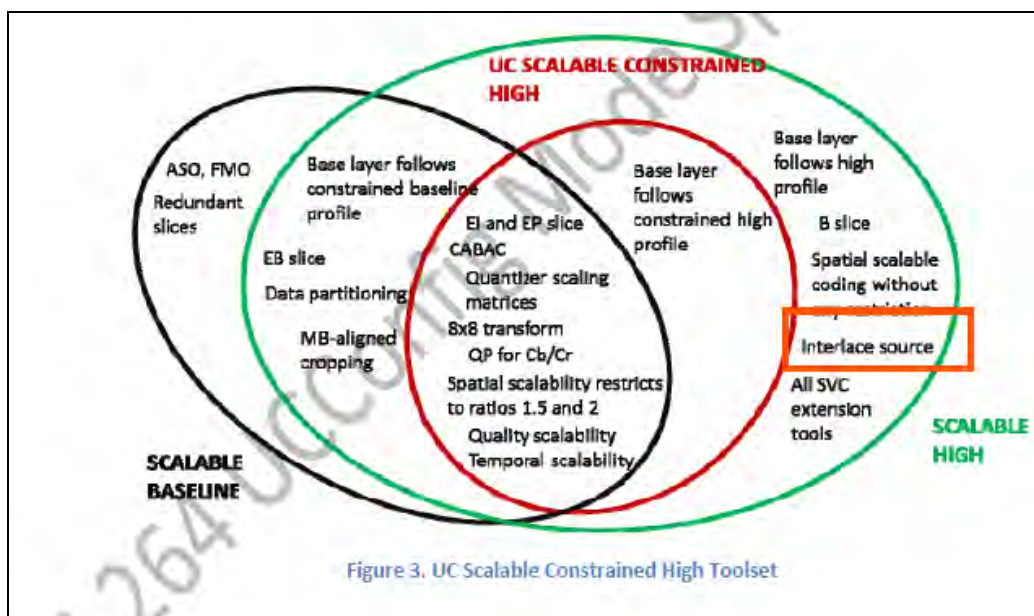
6.1. Encoding Toolset

Here are the basic requirements that encoders shall meet in conformance to this specification:

- H.264 UCConfig Mode 0: Conformant to the **Constrained Baseline** profile or Unified Communication (UC) Constrained High toolset.
- H.264 UCConfig Mode 1: Conformant to the **Unified Communication (UC) Constrained High** toolset.
- H.264 UCConfig Modes 2q, 2s, and 3: Conformant to the **UC Scalable Constrained Baseline** toolset and the **UC Scalable Constrained High** toolset.

(MOTM WASH1823 0602954.) Pages 6-9 of this document show that none of these profiles supports interlaced coding.

- For Scalable Constrained High, interlacing falls outside the supported functions.



- Constrained Baseline does not support interlaced coding tools. (*See* Iain E. Richardson, The H.264 Advanced Video Compression Standard, 2nd Edition, at 225.)
- As for Scalable Constrained Baseline, the document states that this profile supports the tools defined in the Constrained Baseline profile and the UC Scalable Constrained High toolset, neither of which support interlaced tools as explained above. (MOTM WASH1823 0602957.)
- For Constrained High, the document also shows that interlaced coding tools are not supported. (MOTM WASH1823 0602955.)

Of the remaining three MMI patents, the ‘419 patent is expired and does not cover software, the ‘968 patent will expire early next year and does not cover software, and the ‘514 patent is not used by H.264.

290. In ¶ 277 of his report, Dr. Drabik asserts that the ‘094 patent applies to Lync. He is mistaken. The ‘094 patent relates to the 4x4 alternate field scan. It is an interlaced coding tool and is not used for progressive video. Progressive video is encoded in frame mode, which uses the zig-zag scan. (*See* March 2010 H.264 Standard at § 0.6.2, 8.5.6.)

B. MMI’s speculation on future products

i. Xbox 720

a. Blu-rays

291. Dr. Drabik speculates about future plans for Xbox to include support for Blu-ray. Xbox does not currently support Blu-ray. Even if true, Dr. Drabik has not identified any document suggesting that Microsoft software will perform Blu-Ray decoding. Hardware-accelerated decoding is common and used by computers running Windows. Moreover, Blu-ray technology is largely inapplicable to MMI’s interlaced patents. This is because Blu-rays are generally coded as progressive. I explained earlier in this report that only 1 out of 60 top sellers

at blu-ray.com was interlaced. Of the remaining three patents, the '419 patent is expired and does not cover software, the '968 patent will expire early next year and does not cover software, and the '514 patent is not used by H.264. In fact, the '419 and '968 patents may expire before a next-generation Xbox is released.

b. Alleged Xbox encoder

292. MMI expert Mr. Dansky states that a future version of Xbox will include H.264 “encoding” capability, citing a deposition transcript from Leonardo Del Castillo. Mr. Del Castillo was asked about a future generation Xbox’s support for H.264 and testified “We haven't decided entirely. But it will likely include H.264 decoding capability and encoding capability.” No follow-up questions were asked about why an Xbox system would include an encoder and what purposes that encoder would serve. Neither Mr. Dansky nor Dr. Drabik identify other evidence of a future Xbox’s encoding capabilities. Accordingly, this assertion was speculation to which I cannot concretely respond. I will respond if presented with technical documents that I can analyze.

ii. Surface

293. Dr. Drabik does not discuss Microsoft’s recently-announced Surface tablet in his report. Mr. Dansky does address Microsoft Surface. (Dansky Opening Report at pages 115-116.) Mr. Dansky concludes that Surface will support H.264 on the basis that a competitor’s tablet, the Apple iPad, supports H.264. He also suggests that the Surface will have cameras, but does not provide any evidence on the specifications of those cameras. These statements are speculative. If Mr. Dansky (or Dr. Drabik) ever offer actual evidence on the specifications for these features, I reserve the right to examine and offer analysis of that evidence.

294. Moreover, the articles that Mr. Dansky himself cites about the Surface show that it will support resolutions of “at least” 720p and 1080p. (Dansky Opening Report at page 116.)

Both video formats are progressive. As I have explained throughout this report, computing devices are unlikely to render interlaced video content. This means that the vast majority of MMI's patent portfolio would not even need to be examined in connection with the Surface's decoder, even if Surface supports H.264 Main and High profiles.

C. MMI's flawed surveys

295. I understand that MMI's expert Dr. R. Sukumar conducted surveys purporting to show usage patterns of Xbox customers. Mr. Dansky relied on some of this survey evidence to support his assertions. Dr. Sukumar's survey included numerous technical deficiencies, some of which I address here.

296. First, Dr. Sukumar provides data for various general Xbox-related activities, such as watching videos, downloading or streaming content, and gameplay. Dr. Sukumar does not indicate the extent to which any of these results relate to H.264 in particular, let alone the interlaced H.264 content to which MMI's patent portfolio almost exclusively relates. (*See* Sukumar Opening Report at pages 9-10, tables 5-6.) Table 8 includes more specific usage scenarios, but suffers from the same deficiency of not indicating what type of video each usage scenario implicates.

297. Table 9 includes a chart identifying number of Xbox users who reported using their Xboxes to watch MBAFF video content as compared to progressive. (Sukumar Opening Report at page 10.) These results are based on questions QH5A1 and QH5A2 of his survey, reproduced below.

QH5A1

informed insights
Privacy Policy

Please select the types of video content you have viewed on your Xbox Console (connected to your TV)
(Please select all that apply)

☐ Interlaced
☐ Progressive
☒ Not sure

Next >

QH5A2

informed insights
Privacy Policy

Please select the types of video content you have viewed on your Xbox Console (connected to your TV)
(Please select all that apply)

☐ MBAFF (Macroblock Adaptive Frame/Field)
☐ Progressive
☒ Not sure

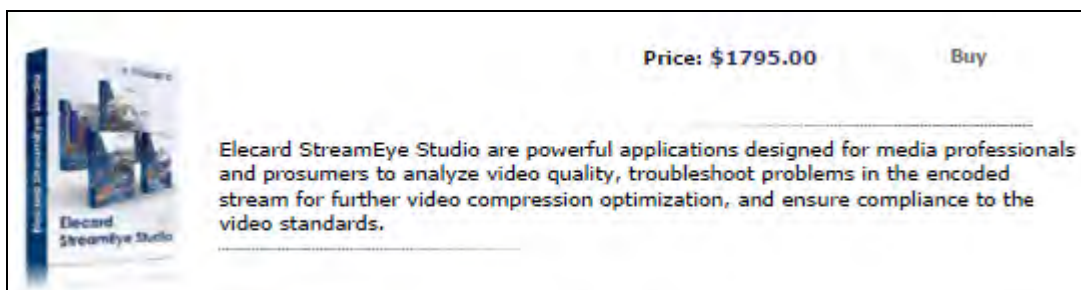
Next >

298. I have used an Xbox. In my opinion, it is not possible for a lay user to determine whether that user is watching MBAFF content. The user might be able to surmise as to whether the content is interlaced or progressive because interlaced video results in certain characteristic visual distortions and artifacts. But even then, a lay user would typically not have the video coding background to understand that these distortions and artifacts are a result of interlacing. For example, the screenshot below shows what a user watching the Xbox Live ESPN app might see. There is nothing indicating that this content is MBAFF-encoded:



299. In fact, some survey respondents reported contradictory survey responses, indicating that they watch progressive content in response to QH5A1 but not in response to QH5A2, or vice versa. This confirms that these questions are not suitable for lay users. (*See* MOTM_WASH1823_0603544.) Other individuals reported watching Hulu Plus, ESPN, and YouTube but did not report having viewed progressive content, even though those services are available through Xbox Live which exclusively supports progressive content. (*See* MOTM_WASH1823_0603544.)

300. Dr. Drabik himself was apparently unable to determine whether video content is MBAFF-encoded just by watching a video. He used a specialized software package called Elecard StreamEye. (*See, e.g.,* Drabik Opening Report at ¶ 80.) This is a \$1795 software package designed for professionals and “prosumers,” not ordinary customers:



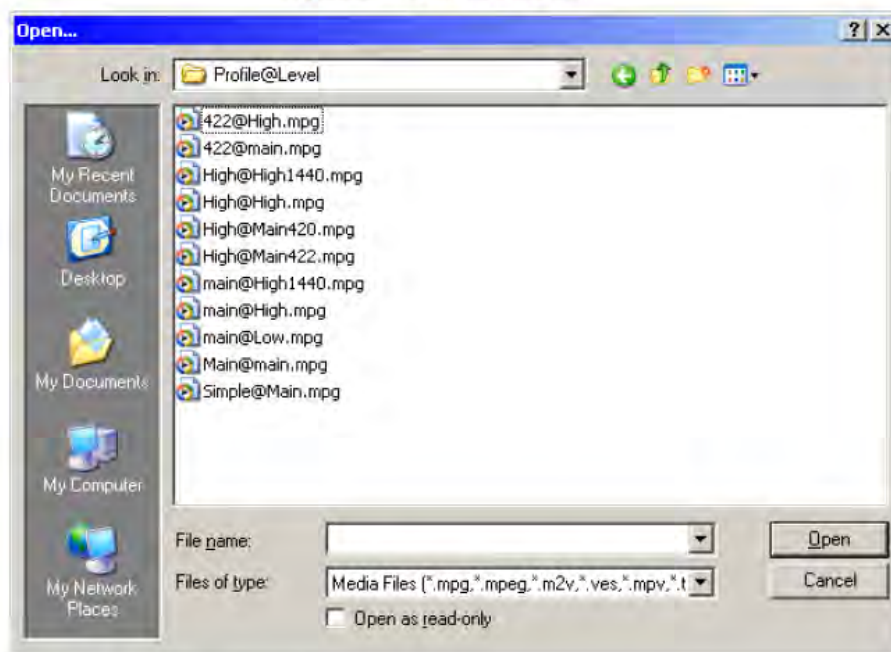
(See <http://www.elecard.com/en/products/professional/analysis/streameye-studio.html>.)

301. Even if ordinary customers used this software (which they do not), the software could not be used to analyze any video feed provided to an Xbox. To analyze video using Elecard, one needs that video in a standalone file container, such as a .mp4 file. The user manual for Elecard Version 3.0⁹⁷ shows this:

⁹⁷ Dr. Drabik does not appear to have identified the version of StreamEye that he used.

2. From the **File** menu select **Open** or click the **Open File** button on the Toolbar. The **Open File** dialog box appears.

Figure 22. Open File Dialog Box



3. Select the file to be opened.
4. If the opened file does not contain video only, the Select Stream dialog box appears. Select the stream to be opened.

(See http://www.elecard.com/assets/files/manuals/streameye/EStreamEye_UG.pdf at 25.) Video is not provided to Xbox as a sequence of discrete files in respective file containers, but rather as a continuous bitstream. Accordingly, even Dr. Drabik's Elecard software could not have been used by consumers in the exceedingly unlikely event that they possessed this software.

VI. THE VALUE OF MICROSOFT'S PATENTS

302. Dr. Drabik concluded that "as a technical matter, the MMI H.264 essential patent portfolio is as valuable, or slightly more valuable, than the Microsoft H.264 patent portfolio." Dr. Drabik therefore concedes at least a level of parity between the two companies' patent portfolios.

303. In my opinion, Microsoft's patents have greater technical significance than MMI's patents. Both companies have patents directed to discrete, technical improvements over

prior and alternative technologies. Microsoft's discrete, technical improvements played key roles in foundational elements of the H.264 Standard. Specifically, Microsoft holds nine patents directed to H.264's Prediction methods and five patents that cover H.264's core Transform. Both are widely cited as key aspects to H.264's improved performance over prior standards. Along with these foundational contributions, Microsoft offered a host of other incremental improvements related to a wide array of technical areas, including deblocking and error resilience.

304. MMI's patents at issue, by way of contrast, includes only two patents that arguably relate to foundational elements of the H.264 Standard.⁹⁸ Neither technology was offered to the JVT through JVT's contributions process, both of these patents have narrow scope that likely exclude software, one of the patents is expired, and one of the patents will expire next year. Fourteen other MMI patents relate to interlaced coding tools which have no applicability to video coding industries aside from lingering use in television broadcast. The last MMI patent is not practiced by H.264 devices.⁹⁹ Even under Dr. Drabik's incorrect analysis, it would apply to Annexes, which Dr. Drabik does not consider to be important.

305. For certain Microsoft patents, Dr. Drabik attempts to minimize their value by explaining that the patent relates to a feature described in an H.264 Annex. But that would also apply to Motorola's Gandhi patent, one of three non-interlaced Motorola patents at issue. In Dr. Drabik's analysis of the Gandhi patent, he makes no effort to explain why a Microsoft product might practice that feature. In contrast, for the Microsoft patents below that relate to an Annex, I explain why the feature is important and likely to be practiced by companies like Motorola.

⁹⁸ These are the Krause and Wu patents.

⁹⁹ This is the Gandhi patent.

306. In my examination of Dr. Drabik's analysis of Microsoft's patents, I follow Dr. Drabik's approach of only addressing U.S. patents. In addition, I focus on granted U.S. patents and not pending applications.

A. Prediction

i. U.S. Patent Nos. 7,003,035 and 7,646,810

307. These patents relate to H.264's "Direct Mode." Dr. Drabik contends that the '035 patent is not essential to the H.264 Standard based on his misreading of exemplary claim 1. Claim 1 recites: "wherein said type of prediction model includes an enhanced Direct Prediction model that includes at least one submode selected from a group comprising a Motion Projection submode, a Spatial Motion Vector Prediction submode, and a weighted average submode."

308. Dr. Drabik contends that this claim does not apply to H.264 because H.264 does not provide for "a weighted average submode." The claim does not require that all submodes be selected. It requires that at least one submode be selected. H.264's Direct Prediction mode includes "motion projection" submode and "spatial motion vector prediction" submode, as Dr. Drabik does not appear to contest. (*See, e.g.*, H.264 Standard at § 8.4.1.2.2 – "Derivation process for spatial direct luma motion vector and reference index prediction mode").

309. With respect to the '810 patent, Dr. Drabik contends that MPEG-2 techniques were an alternative. In doing so, he states without citation that "it was known to use temporal prediction for a direct mode macroblock in a B slice." (Drabik Opening Report at ¶ 288.) I am not aware of MPEG-2 having defined a "direct mode macroblock" and do not believe that temporal prediction as defined and used for MPEG2 offered an alternative to the inventions disclosed in the '035 and '810 patents. Certainly, Dr. Drabik has not offered sufficient analysis to establish his assertion.

310. Dr. Drabik further proposes that an alternative to the Microsoft patents can be found in MMI and Matsushita proposals related to direct-mode using temporal prediction. The documents cited as representing this alternative (VCEG-O26, JVT-B057, and JVT-B071) accurately reflect the condition of direct-mode motion vector prediction prior to the Microsoft contribution. The Microsoft inventions were adopted in view of recognized problems with those purported alternatives. Microsoft's submission JVT-C127 increased the efficiency of the existing direct-mode prediction, and Microsoft's submission JVT-D040r1 proposed the comprehensive redesign of the direct-mode prediction that has been incorporated into today's H.264 Standard. Section 1-2 of JVT-D40r1 outlines problems with prior direct-mode schemes, ranging from inefficiency, problems handling scene changes, high complexity and storage requirements, and inability to handle video applications that lacked absolute time-stamps. The Microsoft proposal addressed these problems and offered bitrate savings of 6.5%, averaged over 7 video sequences. That gain is certainly comparable or better than the gain provided by any MMI contribution. Moreover, that gain is not limited to interlaced video content.

311. Drabik's cites as yet another alternative the use of a weighted average of temporal and spatial prediction. Claims from the '035 patent, however, list "weighted average submode" as an alternative: "*selected from a group comprising a Motion Projection submode, a Spatial Motion Vector Prediction submode, and a weighted average submode.*" Accordingly, Dr. Drabik's alternative would fall within the scope of at least that patent.

312. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

ii. U.S. Patent No. 7,280,700

313. This patent also relates to H.264's Direct Mode. Dr. Drabik's first proposed set of alternatives to this patent are the same as what he cited in connection with the '810 patent, discussed above. (Drabik Opening Report at ¶ 293.) I incorporate here my discussion of those alternatives.

314. Dr. Drabik presents another alternative in which direct mode signaling occurs at the macroblock level rather than at the slice level. Requiring an extra bit for every direct-mode macroblock would represent a bitrate increase that can be costly for low low-bitrate applications. Indeed, low-bitrate applications make extensive use of direct-mode in order to reduce the bitrate used for B-pictures to extremely low levels. I am not aware of any tests of a macroblock-level selection scheme for direct-mode, likely because such an alternative may not have been considered viable at the time the JVT adopted Microsoft's approach. This is not a viable alternative to Microsoft's patent.

315. Finally, Dr. Drabik suggests using "slice-level syntax that indicates a decision between more than just spatial direct mode prediction and temporal direct mode prediction." He offers this alternative based on a misreading of the Tourapis paper. Alexis Tourapis was a Microsoft employee. The Tourapis paper was co-authored by three other Microsoft employees, including all named inventors of the Microsoft '700 patent. The paper was written in 2005, years after the '700 patent was filed and H.264's Direct Mode architecture was in place. Moreover, that paper discusses a modification of direct-mode coding called the "MB-based spatiotemporal method." The Tourapis method provides additional criteria by which either temporal or spatial direct mode will be chosen for B-slices. (*See* Tourapis paper at § III.) The Tourapis paper proposes the MB-based spatiotemporal method within the context of slice-based direct mode signaling. Specifically, Tourapis explains that slice-level decisions selecting between temporal

direct mode and spatial direct mode will require one bit. In one alternative, the MB-based spatiotemporal method leaves those two modes intact and adds a third mode, along with a second bit that can signal the third mode. Because the original two modes are still intact, this alternative will still infringe the claim. In a second alternative, Tourapis suggests that the MB-based spatiotemporal adds an additional mode in place of the temporal mode. In this additional mode, “we perform a combination of the temporal and spatial methods by adaptively selecting each method depending on the characteristics of its colocated region.” (Tourapis paper at § III.) Bits that indicate a decision between spatial direct mode on the one hand and an adaptive temporal/spatial mode on the other hand still qualifies as “slice-level syntax information indicating a decision between temporal motion vector prediction and spatial motion vector prediction for a slice of a B-picture in a video sequence, wherein the slice-level syntax information facilitates selectively applying spatial prediction of motion associated with the slice of the B-picture in the video sequence.” Accordingly, this alternative falls within the scope of the patent.

316. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft’s adopted technology. His assertions that they are alternatives are therefore unsubstantiated.

iii. U.S. Patent No. 7,609,767

317. This patent relates to weighted prediction. Dr. Drabik’s proposed alternatives are all limited in scope to B-pictures and so have limited applicability compared to Microsoft’s invention. Dr. Drabik also proposes the alternative of signaling fading compensation at the macroblock layer. That approach would sacrifice bitrate over extended periods of video that do not have fades. Finally, Dr. Drabik references the “implicit method.” The implicit method has limited flexibility because it automatically selects one of just two weighting factors. Finally, Dr.

Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions that they are alternatives are therefore unsubstantiated.

iv. U.S. Patent Nos. 7,116,830, 7,263,232 and 7,577,305

318. These patents relate to intra prediction. Dr. Drabik first addresses the '830 and '305 patents but later incorporates the same analysis for the '232 patent. (Drabik Opening Report at ¶ 319.) All of his proposed alternatives would either still infringe Microsoft's patents or would not offer the level of performance offered by Microsoft's patents.

319. Dr. Drabik's first proposed alternative involves switching which spatial extrapolation mode to choose in the event that the first and second spatial extrapolation modes equal one another. That alternative would likely infringe under the doctrine of equivalents because the relevant claim limitation addresses the situation in which the two modes are equal to one another. Moreover, this "alternative" would not apply to claims in the '305 and '232 patents.

320. Dr. Drabik's second alternative, also set forth in paragraph 317 of this report, proposes using a predicted mode some of the time and an "actual" mode the rest of the time. But in the instances where a predicted mode was used, the patent claims would still be practiced, meaning this alternative still falls in the scope of Microsoft's patents.

321. Finally, Dr. Drabik references Telenor and Real Networks proposals. The approach ultimately taken by the H.264 Standard, reflecting the inventions of the '830 and '305 patents, were proposed as improvements to these earlier methods. Dr. Drabik does not offer evidence to support an opinion that the earlier methods offered the same performance to the '830 and '305 patents. In my view, the '830 and '305 patents would provide gain as compared to the prior contributions on which they built.

322. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

v. U.S. Patent Nos. 7,162,091 and 7,181,072

323. Dr. Drabik does not identify a viable alternative to these patents that was available at the time of the development of H.264. He refers to MPEG-2. (Drabik Opening Report at ¶ 326.) But he does not relate MPEG-2 to the elements of the patent claims. In fact, MPEG-2 did not include intra-frame spatial prediction comparable to the invention of the '091 and '072 patents, thus limiting its coding efficiency compared with H.264. The only proposed alternative that Dr. Drabik suggests involves the claim element directed to the top left block of the video frame. The claim calls for using a gray value for its prediction. Dr. Drabik proposes using "a gradient of values" for its prediction. Dr. Drabik's proposal does not make sense because there are no values to take a gradient of – as this is the top-left block of the frame, there are no previously coded blocks above or to the left of this block, and thus no basis for computing a gradient.

324. Drabik also includes a passing reference to a method for operating on multiple blocks to the left of the current block. (Drabik Opening Report at ¶ 326.) Dr. Drabik does not describe the method at all, offers no evidence to support the fact that the method was known at the time of H.264 development, cites no documents, and offers no evidence to support his claim that the alleged method "could be expected to have comparable performance."

325. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

B. Transform and Quantization

i. **U.S. Patent Nos. 6,882,685, 7,106,797, 7,773,671, 7,839,928 and 7,881,371**

326. Transform is a key component for any video coding standard. It is one of the main elements of an encoding or decoding pipeline. In my opinion, the 4x4 transform is probably the most fundamental and important component of H.264, used as part of almost *every* mode included in H.264, and issues of reliability and timeliness are important engineering criteria in the selection of such critically important components.

327. Microsoft proposed a 4x4 transform that was incorporated into H.264. Dr. Drabik is correct that other companies had proposed alternative 4x4 transforms. But Dr. Drabik misstates the nature of the JVT proceedings that resulted in adoption of Microsoft's transform. In actuality, the JVT deliberated on a number of factors and determined that Microsoft's transform provided certain advantages as compared to the alternatives. As such, Microsoft's contribution presented discrete technical advantages for a critically important part of the decoding pipeline.

328. Dr. Drabik identifies alternate proposals by Texas Instruments and FastVDO. A JVT Ad Hoc Group carefully considered these proposals against Microsoft's transform. Dr. Drabik suggests that Microsoft's transform was adopted "out of a desire to make a decision." (Drabik Opening Report at ¶ 340.) That quotation was out of context. The full quotation reads:

Conclusion: Based on the overall considerations described above and the current state of maturity and the desire to make a decision as we approach CD state, the JVT-B038 proposal has been recommended for adoption.

(JVT-B001 at 22.) In other words, the JVT needed to proceed with its best judgment given the data it already had because a committee draft would soon need to be created.

329. Immediately preceding this statement, the JVT listed a number of considerations comparing Microsoft's transform with the other proposals. These are listed below (in some instances, I have separately listed items that the JVT discussed as a single group).

- 1) Complexity. The JVT found no significant difference.
- 2) Rounding requirements. The Texas Instruments proposal required more rounding.
- 3) Ability to implement with shift-adds. The Texas Instruments was less "friendly".
- 4) Matrix-multiply matching shift-add. FastVDO did not satisfy this property.
- 5) Quantization weighting matrix complexity. The JVT expressed some concern about Microsoft and FastVDO's proposals.
- 6) Quality. The JVT reported no differences.
- 7) Testing. The JVT reported that FastVDO offered fewer test results as compared to Microsoft.
- 8) Inconsistent test results at high rates. This was reported as a concern for the FastVDO implementation.
- 9) Verification. The Microsoft proposal was cross-verified in independent implementations, whereas the other proposals were not.
- 10) Software Availability. Microsoft's software had been available for over a month, TI's had been available since "last week," and FastVDO's was not yet available.
- 11) Greater depth extension. Microsoft and FastVDO allowed design of a family of transforms to easily support greater bit depth. TI had no obvious way to do so.
- 12) Finer quantization. The Microsoft proposal had been tested with "no obvious problem" whereas the other proposals had not been tested.

13) Coarser quantization. The TI approach was not suitable and would require design changes.

14) Use with Quantization Matrices. The JVT reported no differences.

15) Consistency with larger block sizes. At least the Microsoft proposal offered this consistency.

330. All these considerations led the committee to recognize the value of both the substantive advantages of Microsoft's transform, as well as the relative maturity and advanced testing of Microsoft's transform.

331. As I explained above, the 4x4 transform is probably the most fundamental and important component of H.264, used as part of almost *every* mode included in H.264, and issues of reliability and timeliness are important engineering criteria in the selection of such critically important components. Dr. Drabik's opinion speculates as to whether the alternatives might be able to address the concerns that were raised, might have proven themselves to be as reliable as the '685 patent's transform through additional testing, and might have ultimately proven comparable to the '685 patent's transform. Microsoft's contribution was important because it was both technically sound, adequately tested, and timely. Dr. Drabik correctly noted timing as one among many important considerations leading the committee to incorporate the '685 transform into the standard. The committee recognized the value of avoiding both the delay to the H.264 development and the risk associated with speculating on the possible performance of other transforms. This was one of the advantages that Microsoft's transform offered.

332. Dr. Drabik is mistaken in interpreting JVT-B001 to mean "... but the JVT stressed that further investigation into the FastVDO transform was warranted." Again, he takes this out of context. The full text reads:

Further study of the family approach proposed in JVT-B103 is considered not incompatible with this decision, and further such investigation is recommended. (JVT-B001 at 21.) This statement recognizes that the ‘685 patent’s transform could be developed as one transform in a family of transforms (as described in JVT-B103), and it recommends further investigation of the family of transforms corresponding to the ‘685 patent’s adopted transform.

333. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft’s adopted technology. His assertions are therefore unsubstantiated.

ii. U.S. Patent No. 7,266,149

334. This patent relates to signaling motion compensation block sizes and transform block sizes. Dr. Drabik’s alleged alternatives are either unrelated to the advantages the ‘149 patent was trying to provide or relate to the Adaptive Block Transform technique that was well-studied but ultimately rejected by the JVT.

335. Dr. Drabik first identifies a proposal from Telenor. (Drabik Opening Report at ¶ 346.) The Telenor proposal only describes an 8x8 transform, without proposing any context for using that transform. (*See, e.g.,* Q15-I-39) (“If *for some reason* one should include the possibility of 8x8 transform in H.26L...” (emphasis added)). The Telenor document does not constitute an alternative to the invention of the ‘149 patent, which addresses (among other things) a method for “selecting a transform size from among plural available transform sizes.”

336. Dr. Drabik also identifies Mathias Wien proposal documents. (Drabik Opening Report at ¶ 346-347.) These relate to Adaptive Block Transform (ABT), a technique that was studied, tested, and carefully considered over a period of over 1.5 years. After this extensive study and refinement, ABT was finally removed from the H.264 Standard in October 2002.

Do we keep ABT in the draft at this meeting? **No.**

Version 2? Possibly. Delay schedule for more work on it? No.

(JVT-E001d1 at page 20) (highlighting in original). ABT was never reintroduced into the H.264 Standard.

337. ABT was not the same as the ‘149 patent because it did not support the selection of transform size. Instead, it matched the transform size to the size of the partition used for motion-compensation. Regarding ABT-related contributions, Dr. Drabik appears mistaken that “[t]he adaptive use of 4x4 and 8x8 transforms proposed by Wien and Bjontegaard was adopted into the H.264 Standard.” (Drabik Opening Report at ¶ 346.) Although Dr. Drabik speculates that the ABT approach to adapting transform size has advantages over the invention of the ‘149 patent, extensive testing proved such speculation to be mistaken. Based on these tests, the JVT understood that Dr. Drabik’s proposed alternative did not offer comparable performance. (*See* JVT-E001d1 at page 20) (removing ABT from committee draft).

338. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning of his own to show the relative coding performance of his alternatives as compared to Microsoft’s adopted technology. His assertions are therefore unsubstantiated.

C. Signaling

i. U.S. Patent Nos. 6,563,953, 6,735,345 and 7,289,673

339. These patents relate to H.264’s coded block patterns. Dr. Drabik identifies two alternatives for the technology claimed by these patents. First, he proposes that one could code chroma and luma separately rather than jointly. That alternative does not apply to the ‘673 patent, which does not have the “jointly” limitation in its claims. *See, e.g.*, ‘673 patent at claim

1. In any event, due to the correlation between the luma and chroma code block patterns, Drabik's alternative would sacrifice some of the coding efficiency of the H.264 Standard.

340. Dr. Drabik also states "it was known to send 'macroblock_type' separately from the variable length code representing the coded block pattern." (Drabik Opening Report at ¶ 358.) That does not apply to claims from the '953 and '345 patents, which do not require that macroblock_type be jointly coded. (*See, e.g.*, '953 patent at claim 12; '345 patent at claim 12.) Moreover, this overlooks the coding gain that can be achieved by joint coding.

341. Dr. Drabik's other alternative, of omitting the coded block pattern when the macroblock type is "intra," is simply a suggestion to remove the patented feature entirely. This is not an alternative to the feature these patents were trying to incorporate. (Drabik Opening Report at ¶ 358.)

342. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

ii. U.S. Patent No. 7,379,607

343. This patent relates to H.264's "skip" mode. Dr. Drabik proposes, as an alternative, the skip mode of MPEG-2 or H.263. These earlier standards signaled skip-mode at the macroblock layer by including a single bit with every macroblock, whether the macroblock was skipped or not skipped. The improvement of the '607 patent results from replacing the large number of COD bits (coded macroblock) with a few symbols indicating runs of skipped macroblocks through the video frame. The savings resulting from the '607 patent become especially significant when video coders are operating at low bitrates. In these settings, many macroblocks must be skipped, and the skipped macroblocks form clusters that are easily

identified by specifying the length of the run of skipped macroblocks. Accordingly, the '607 patent provided incremental improvement over the alternative that Dr. Drabik identified.

344. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

D. Deblocking

i. U.S. Patent No. 7,120,197

345. This patent relates to H.264's deblocking filter. Dr. Drabik cites a variety of alternatives but the deblocking filter adopted into H.264 offers advantages over them all. The H.263 deblocking algorithm that Dr. Drabik identifies is essentially a primitive smoothing algorithm that is not comparable to the H.264 deblocking algorithm in quality. Drabik offers no evidence to the contrary. Likewise, there is no evidence showing that the Samsung algorithm is comparable to the H.264 deblocking algorithm.

346. The Telenor algorithm shares features of the H.264 algorithm and reportedly demonstrated comparable coding efficiency, but was far more complex than what was adopted into H.264. *See, e.g.,* VCEG-M82d1 at page 6 ("... decoding complexity is governed by the deblocking filter and sub-pixel operations.") Indeed, Dr. Drabik's choice of the Telenor deblocking algorithm as an alternative comes at a significant cost in higher complexity. Its author, in section 4 of VCEG-L18, identifies the complexity of the deblocking algorithm as a priority for improvement.

347. Algorithms with more complexity limited the viability of H.264 in low-power, low-processing environments. Ultimately, higher complexity for H.264 lowers the battery-life of any hand-held device doing H.264 decoding. The algorithm adopted into H.264, and encompassed by the '197 patent, offers the advantage of performance with low complexity.

348. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

E. Error resilience

i. U.S. Patent Nos. 6,912,584, 7,685,305 and 7,734,821

349. These patents relate to H.264's SP slices. Dr. Drabik is mistaken in claiming that two alternative techniques offer comparable performance to the invention of the '584, '305, and '821 patents. Dr. Drabik's first purported alternative is that "prior standards allowed a temporally predicted picture to use a picture other than the immediately preceding picture as a reference picture for temporal prediction." For this assertion, he cites Annex N of H.263. (Drabik Opening Report at ¶ 383.) But using other pictures for temporal prediction is unrelated to the use of SP pictures. Dr. Drabik does not identify or explain what techniques from Annex N serve as alternatives to SP pictures. I reserve the right to respond to any opinion Drabik may offer in the future concerning the use of Annex N as an alternative to the invention of the '584, '305, and '821 patents.

350. Next, Dr. Drabik identifies a Nokia proposal concerning SP pictures as an alternative to the invention of the '584, '305, and '821 patents. The Nokia proposal (VCEG-L27) was made in January, 2001, nearly 2 years after the March 12, 1999 priority date of the '584, '305, and '821 patents. Thus, the Nokia proposal does not represent an alternative to the Microsoft invention, but is a refinement of the technique invented in the '584, '305, and '821 patents.

351. Finally, Dr. Drabik proposes that extra intra (I) slices can be used instead of SP-slices as an alternative to the invention of the '584, '305, and '821 patents. The Richardson textbook explains the high cost of this alternative: "Switching can be accommodated by inserting

an I-slice at regular intervals in the coded sequence to create ‘switching points’. However, an I-slice is likely to contain much more coded data than a P-slice and the result is an undesirable peak in the coded bitrate at each switching point.” (MOTM_WASH1823_0336629.) Dr. Drabik cites VCEG-L46 to show that his purported alternative has lower complexity. But VCEG-L46 goes on to clearly identify the high cost of Drabik’s proposed alternative relative to the invention of the ‘584, ‘305, and ‘821 patents. From the sentence immediately following the sentence cited by Drabik: “The proposed method would also entail some quality loss within the sequence to be joined, although not nearly as much quality loss as including an intra picture while trying to remain within a bit rate constraint.” (MS_MOTO 00003700694)

352. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft’s adopted technology. His assertions are therefore unsubstantiated.

ii. U.S. Patent Nos. 7,505,485 and 7,839,895

353. These patents relate to H.264’s start code emulation prevention. Dr. Drabik proposes three alternatives, none of which would offer the same performance as Microsoft’s patented feature. The first proposed alternative uses a video syntax that avoids start code emulation entirely, as was used in the variable-length codes of earlier standards. This would severely limits the potential coding efficiency of H.264. Even for variable-length codes like CAVLC, there could be a performance impact due to the limitations that this approach imposes on the code space available to the codec. Moreover, this alternative precludes the use of H.264’s high-efficiency arithmetic coding option (CABAC), which does not use predefined variable length codes. In my opinion, sacrificing the CABAC option in H.264 severely reduces algorithm performance in many applications.

354. Dr. Drabik's second alternative to the invention of the '485 and '895 patents is a one-page document that was offered as food-for-thought by one JVT member, Stephan Wenger, at one meeting. (JVT-B104.) Mr. Wenger proposed to end all continuing work on the topic of start-code design and emulation prevention. Mr. Wenger's proposal was not approved, and extensive work on the topic continued through many future meetings. Though Drabik offers nothing more than repeating the reasoning of Mr. Wenger's original proposal, Dr. Drabik's second alternative directly conflicts with the consensus of the JVT, and in my opinion it would severely limit the viability of the H.264 Standard in many applications.

355. Dr. Drabik's third alternative is nothing more than a special case of his first alternative. The document he cites describes the use of reversible variable-length codes (RVLC) and the use of bit-stuffing to avoid start-code emulation problems specific to the use of RVLC's. Since RVLC's are not used in H.264, and the bit-stuffing, as described, only applies to VLC's (and not CABAC), this third alternative offers nothing more than the first alternative, and would severely sacrifice H.264 algorithm performance in many applications.

356. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

iii. U.S. Patent No. 7,248,740

357. This patent relates to start code emulation prevention features. This patent relates to an H.264 Annex, but is important and likely to be practiced by devices that decode video which can lose byte alignment through bit-losses or erasures. Many decoders receiving video bitstreams transmitted over noisy communication channels (*e.g.*, wireless) that can suffer such losses, and those decoders will need to recover byte-alignment after bit losses in order to properly decode subsequent data.

358. As far as proposed alternatives to Microsoft's patent technology, Dr. Drabik simply incorporates his proposed alternatives to Microsoft's '485 and '895 patents. I incorporate my discussion of those alternatives here as well. I reserve the right to offer an opinion on the cost, relative to the invention of the '740 patent, of any future alternative Dr. Drabik may propose.

359. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

F. Other patents

i. U.S. Patent Nos. 7,646,816 and 7,593,466

360. This patent relates to conformance issues in connection with the hypothetical reference decoder. Although this feature is described in an H.264 Annex, Dr. Drabik's assertions on the importance of these patents is not correct and this patent is likely to be practiced by decoder manufacturers. Dr. Drabik contends: "A compliant decoder does not have to use the VUI parameters in Annex E." (Drabik Opening Report at ¶ 407.) But assuming a decoder manufacturer wants to check bitstream conformance and output timing conformance, some VUI parameters are required.

*Some VUI parameters **are required** to check bitstream conformance and for output timing decoding conformance.*

(H.264 Standard, Annex E, at 372 (emphasis added).) The HRD parameters defined in the invention of the '816 and '466 patents are the specific VUI parameters referred to in this statement.

361. Dr. Drabik's citations to statements by Ajay Luthra do not change this. Other testimony from Dr. Luthra in that deposition shows that, as a practical matter and for a given application at hand, one will want to ensure that the decoder satisfies timing requirements:

*Q. I guess I'm not clear what the hypothetical reference decoder does in that case.
A. It primarily makes sure that the bits that are coming in the receiver before they reach what you are calling a decoder, how fast they come in, how fast they pull out. The text specification generally in H.264 also known as AVC, does not have the concept of timing associated in there. So when you want to implement in the application like a digital television, the timing needs to be associated with it, and HRD at a high level achieves that functionality.*

(Luthra Deposition at 31:19-32:6.)

362. Dr. Luthra was describing output timing conformance of decoders and that is what these Microsoft patents relate. Specifically, decoder conformance is defined in section C.4 starting on page 316 of the H.264 Standard. That section defines two types of conformance that can be claimed by a decoder: output timing conformance and output order conformance. Output order conformance ignores all issues associated with communication of the encoded video bitstream, and it assumes that the entire video file (from beginning to end) is available at the decoder at the start of the decoding process. An example of this is when a video is saved to the computer's local memory.

363. Output order conformance does not verify a decoder's ability to correctly decode any video between transmitted over a communication channel, such as the Internet or wireless channels. Output timing conformance verifies a decoder's ability to correctly decode an encoded video source being streamed over such a channel, considering both the characteristic of the channel and the hardware capabilities of the decoder.

364. The vast majority of current video applications involve decoding of streaming video sources, and decoder conformance in these applications would most certainly focus on

output timing conformance. The H.264 standard uses the invention of the '816 and '466 patents to conduct output timing conformance of decoders. That is why, notwithstanding Dr. Drabik's selected quotations to the contrary, these patents are important for many real world applications and are likely to be practiced by decoder manufacturers whose decoders receive data over communication channels.

365. Finally, Mr. Ribas-Corbera (the source of Drabik's final citation) is correct in stating that "... [v]ideo coding standards do not mandate specific encoder or decoder buffering mechanisms...". Mr. Ribas-Corbera was explaining that standards do not mandate buffering mechanisms but was not commenting on the whether coding standards (or real world applications, as a practical matter) require specific timing requirements.

366. Dr. Drabik's alternatives to these patents do not offer the same advantages of these patents. Early systems for delivering digital video (*e.g.*, cable, satellite, DVD's, etc.) required that all receivers accessed the encoded video stream over a channel with common characteristics (bitrate, buffer capacity). The alternatives to the '816 and '466 patents cited by Drabik are algorithms designed to control the quality of video delivered over these types of systems. Many of today's important video applications require that video content be delivered to whatever device accesses it, over whatever quality channel is connected to the device. The alternatives proposed by Drabik would be forced to address such video applications by sending to all receiving devices the same video stream that could be received by the worse-case channel and slowest device. The benefits of the invention of the '816 and '466 patents are explained in the summary of the invention

Benefits of the generalized reference decoder include that a content provider can create a bit stream once, and a server can deliver it to multiple devices of different capabilities, using a variety of channels of different peak transmission rates. Alternatively, a server and a terminal can negotiate the best leaky bucket parameters for the given networking conditions, e.g., the one that will produce the lowest start-up (buffer) delay, or the one that will require the lowest peak transmission rate for the given buffer size of the device. In practice, the buffer size and the delay for some terminals can be reduced by an order of magnitude, or the peak transmission rate can be reduced by a significant factor (e.g., four times), and/or the signal-to-noise ratio (SNR) can increase perhaps by several dB without increasing the average bit rate, except for a negligible amount of additional bits to communicate the leaky bucket information.

(‘816 Patent at 2:37-52.)

367. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft’s adopted technology. His assertions are therefore unsubstantiated.

ii. **U.S. Patent Nos. 7,024,097, 7,142,775, 7,167,633, 7,171,107 and 7,248,779**

368. These patents relate to time coding features of H.264. These features are part of H.264’s Annexes, but time coding is required in most activities of video production, editing and distribution, and it is becoming increasingly important in advanced multimedia applications of video in order to synchronize multiple sources of video with other forms of multimedia content including audio, graphics, animations, and the like.

369. Timecoding information included in the H.264 syntax is needed to comply with the requirements of those applications. Developers of the H.264 Standard put significant effort towards defining a syntax for timecode information that maintained compatibility with techniques of the video production and distribution industry, while accommodating the more challenging synchronization requirements of evolving multimedia applications.

370. As far as alternatives, Dr. Drabik simply identifies alternatives that were described in the '097 patent, focusing in particular on SMPTE approaches. But the '097 patent's invention was described and claimed as an improvement over those approaches.

Timecoding systems, methods and data structures are described which, in some embodiments, permit a true time to be ascertained from media samples whose timecodes contain an amount of drift which can arise from having non-integer frame rates. Inventive methods incorporate the use of an offset parameter that describes a time difference between a timecode and a true time associated with a media sample. The inventive approaches can be incorporated with and used compatibly in connection with current timecoding paradigms such as SMPTE timecode and the like. Further embodiments permit timecoding to take place at the field level of a frame. This can permit true-time calculations to be done to ascertain the true time associated with individual fields of a frame. In addition, other embodiments provide novel counting compensation methods that are directed to reducing the drift that can be associated with media samples that are sampled at non-integer frame rates.

('097 patent at Abstract.) Dr. Drabik does not provide alternatives for the inventive features of this patent incorporated into H.264.

371. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

iii. U.S. Patent Nos. 7,242,437 and 7,633,551

372. These patents relate to sending timestamp information. These patents are described in H.264 Annexes, but are likely to be practiced due to the important role of time stamp information in enhancing the value of the H.264 video coding standard to developers of video applications.

373. Dr. Drabik's proposed alternative, to send full timestamps with each picture, does not offer comparable performance. The invention of the '437 and '551 patents results in a

considerable reduction in the bits needed to convey timing information for virtually all video sequences. Drabik argues that a worse-case video sequence would not experience the claimed bitrate reduction, but the video sequence he hypothesizes is an unlikely example. In that video sequence, all sequential frames have time stamps that do not have common seconds_value, minutes_value, or hours_value values, which would be unlikely to occur.

374. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

iv. U.S. Patent Nos. 7,271,849, 7,274,407 and 7,286,189

375. These patents relate to "pan and scan" functionality in which video of one resolution is displayed on a screen having a different resolution. These features are described in an H.264 Annex, but are important and likely to be used by decoders that can be used with a variety of display devices. Dr. Drabik's fails to recognize the important role of multiple display region information in enhancing the value of the H.264 video coding standard to developers of video applications that deliver video content to clients having different types of displays.

376. Dr. Drabik's proposed alternatives do not offer comparable performance to the invention of the '849, '407, and '189 patents. Dr. Drabik's alternatives are essentially to remove the patent feature altogether, with no other replacement feature to take its place. The proposed alternatives do not provide the flexibility of the Microsoft invention in supporting delivery of video content to heterogeneous collections of client displays (e.g. LCD televisions, desktop and laptop computer displays, tablet displays, smartphone displays, etc.).

377. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

v. **U.S. Patent No. 7,149,247**

378. This patent relates to providing random access points (RAPs) to video sequences notwithstanding prediction-related dependencies among the sequence's frames. This feature is described in an H.264 Annex, but is likely to be practiced because RAP information plays a critical role in providing developers of video applications with flexible random access to arbitrary points in a video sequence. This is especially true for H.264 codecs because H.264 employs significant dependencies among frames during prediction.

379. Dr. Drabik's first proposed alternative ("best effort" decoding), does not provide comparable performance to the invention of the '247 patent. H.264 presents complex dependencies, for which "best effort" decoding cannot provide access to random points in the video. The '247 patent explains that "Pictures may also be sent long before they are needed for display, so a decoder using random access *may not have any assurance* of having all the pictures that need to be displayed even if it is able to decode all pictures that it encounters." ('247 patent at 7:58-62.)

380. Dr. Drabik's second proposed alternative is MPEG-2's closed GOP flag. This likewise does not provide comparable performance to the invention of the '247 patent, as the patent itself explains:

381. This is not sufficiently flexible for the standard described above. If all that is available is a close GOP flag, then there is no assurance that any P-pictures or B-pictures of the subsequent video that follow an I-picture can be decoded unless the flexible referencing capability of the new draft standard were to be impaired to impose this behavior.

('247 patent, col. 8:7-13.) Both of Dr. Drabik's alternatives fail to provide random access to points in the video, or force the encoder to limit the coding flexibility offered in H.264, thereby sacrificing coding efficiency.

382. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

vi. U.S. Patent No. 7,155,055

383. This patent relates to color space mapping that allows a decoder to receive a data stream occupying a YCoCg color space and provide a display device with data occupying the familiar RGB (Red, Green, and Blue) color space so that a display screen can display the correct colors.

384. This technology is important because color space information can increase the coding efficiency of the H.264 Standard, as documented in Table 1 of JVT-H031r2.

Color Transform	Coding gain, dB
Optimal (KLT)	4.54
ITU-R BT.709 [1]	3.44
FCC [4]	3.53
ITU-R BT.470-2 [5]	3.54
SMPTE 170M [6]	3.54
SMPTE 240M [7]	3.48
Proposed YCoCg	4.21

Table 1: Theoretical coding gain for several color space transforms, for the 24 RGB images in the Kodak test set. KLT is the statistically-optimal Karhunen-Loève transform. The numbers in square brackets are the values of the parameter **matrix_coefficients**, in Table E.5 of H.264/AVC.

385. JVT-H031r2 concludes: [p. 4] "... we see that the YCoCg leads to a 0.7 dB improvement in coding gain when compared to these transforms."

386. Dr. Drabik's proposed alternative to the invention of the '055 patent does not offer comparable performance. As noted from the table above, the invention of the '055 patent gives a 0.7 dB coding gain improvement over Dr. Drabik's alternative color space. Furthermore, Drabik is mistaken in claiming that the alternative would minimize complexity. The invention of the '055 patent uses only shifts and adds, and it thus reduces the complexity of the decoder compared with the alternative color space proposed by Drabik.

387. Finally, Dr. Drabik has not offered any numerical evidence or other technical reasoning to show the relative coding performance of any of his alternatives as compared to Microsoft's adopted technology. His assertions are therefore unsubstantiated.

VII. CONCLUSION

388. I reserve the right to supplement or amend the opinions I have expressed, for example, as a result of opinions later expressed by other experts in this matter or new information made available to me.

Dated: August 10, 2012

A handwritten signature in black ink that reads "M. B. Orchard". The signature is written in a cursive, flowing style.

Michael Orchard

Exhibit A: Materials considered